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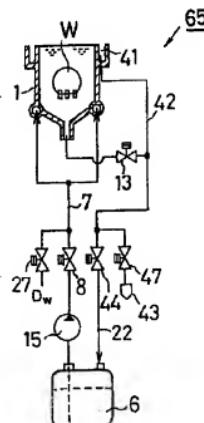
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(54) 【発明の名稱】 蒸板の浸漬処理装置

(57) 「重約」

【目的】 半導体基板などの表面処理を行う基板処理装置が大型化するのを防止しつつ浸漬処理装置の処理液の消費量を抑えてコストを低減する。

【構成】 オーバーフロー型の基板処理槽1から導出した排液路4 2を分歧して、一方を排液弁4 7を介してドレン4 3に、他方を処理液回収路2 1として処理液回収弁4 4を介して処理液貯留容器6に接続する。複数個の表面処理毎に、基板処理槽1からオーバーフローした処理液を処理液回収弁4 2を介して貯留容器6に回収して再利用する。蒸煮処理から純水処理への移行に際して、各基板処理槽内に処理液が入った状態で純水を供給し、オーバーフローさせて処理液を純水に置き換え、基板を空気に触れさせないで、基板の表面に酸化皮膜が形成されるのを防止する。



【特許請求の範囲】

【請求項1】 处理液中に基板を浸漬して基板の表面処理をなすオーバーフロー型の基板処理槽と、上記基板処理槽に連結した処理液供給路と、上記処理液供給路に処理液導入弁及び圧送ポンプを順に介して連通した処理液貯留容器と、上記処理液供給路に純水導入弁を介して連通した純水供給路と、上記基板処理槽よりオーバーフローした排液を排液ドレンに導出する排液路とを具備して構成する基板の浸漬処理装置において、

上記排液路を分岐して一方は排液弁を介して排液ドレンに連通するとともに、他方は処理液回収路として処理液回収弁を介して上記処理液貯留容器に連通し、
薬液処理では、処理液貯留容器内の処理液を処理液供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から処理液回収弁を介して当該処理液貯留容器に回収し、
上記薬液処理の後で行われる純水処理では、純水を純水供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から排液弁を介して排液ドレンに廻収し、
上記薬液処理から純水処理への移行に際しては、処理液の供給を停止し、統いて、上記基板処理槽に処理液を入れた状態で純水を供給してオーバーフローさせることにより、上記基板処理槽内の処理液を純水に置き換える、ことを特徴とする基板の浸漬処理装置。

【請求項2】 处理液中に基板を浸漬して基板の表面処理をなすオーバーフロー型の基板処理槽と、上記基板処理槽に連結した処理液供給路と、上記処理液供給路に処理液導入弁及び圧送ポンプを順に介して連通した処理液貯留容器と、上記処理液供給路に純水導入弁を介して連通した純水供給路と、上記基板処理槽よりオーバーフローした排液を排液ドレンに導出する排液路とを具備して構成する基板の浸漬処理装置において、

上記排液路を分岐して一方は排液弁を介して排液ドレンに連通するとともに、他方は処理液回収路として処理液回収弁を介して上記処理液貯留容器に連通し、
HF処理では、処理液貯留容器内のHFを処理液供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から排液弁を介して当該処理液貯留容器に回収し、
上記HF処理の後で行われる純水処理では、純水を純水供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から排液弁を介して排液ドレンに廻収し、
上記HF処理から純水処理への移行に際しては、HFの供給を停止し、統いて、上記基板処理槽にHFを入れた状態で純水を供給してオーバーフローさせることにより、上記基板処理槽内のHFを純水に置き換える、ことを特徴とする基板の浸漬処理装置。

【請求項3】 請求項1又は請求項2に記載の基板の浸漬処理装置において、
前記処理液供給路の圧送ポンプと前記処理液導入弁との

間にフィルタを付設するとともに、処理液導入弁よりも下流側に純水供給路を連通し、
上記処理液供給路の圧送ポンプと純水供給路接続部との間に処理液回収路を接続し、
純水処理では、圧送ポンプで汲み上げた処理液を処理液回収路に連通させて上記処理液貯留容器に還流させる、ことを特徴とする基板の浸漬処理装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、基板処理装置の浸漬処理において半導体ウエハや液晶用ガラス基板等の薄板状の基板（以下単に基板と称する）を表面処理するのに用いられる基板の浸漬処理装置に関する。

【0002】

【従来の技術】 上記基板処理装置としては、従来より例えば図19に示すものがあり、その浸漬処理部165において用いられる基板の浸漬処理装置としては、図20に示すもの（以下従来例1という）、あるいは、特開平4-42531号公報に開示されたもので、図21に示すもの（以下従来例2という）が知られている。ここで図19は基板処理装置全体の平面図である。

【0003】 この基板処理装置150は、図19に示すように、基板Wを収容したカセットCの搬入部151と、カセットCから基板Wを取り出す基板取出部160と、複数の基板Wを一括保持して搬送する基板搬送ロボット175と、基板搬送ロボット175のチャックハンドを洗浄するチャック洗浄部163と、当該ロボット175で保持した複数の基板Wを浸漬して順次処理する複数の浸漬処理部165と、浸漬処理部165の後側に配置された乾燥部170と、カセットC内へ処理済みの基板Wを収納する基板収納部180と、基板Wを収納したカセットCを搬出する搬出部152とから構成されている。

【0004】 そして上記浸漬処理部165には、例えば図20(A)(B)に示すような浸漬処理装置が配置され、各種の表面処理をなすように構成されている。図20(A)は基板Wを複数種の処理液による表面処理（以下薬液処理という）をするための基板の浸漬処理装置であり、図20(B)は当該基板Wを純水D₁によるリンス処理（以下純水処理という）をするための浸漬処理装置である。これらの浸漬処理装置は、上記浸漬処理部165(165a～165f)のいずれかに適宜配置される。

【0005】 図20(A)の浸漬処理装置は、処理液中に基板Wを浸漬して表面処理をするオーバーフロー型の基板処理槽101aと、基板処理槽101aに連結した処理液供給路107と、処理液供給路107に処理液導入弁108、フィルタ110、及び圧送ポンプ115を順に介して連通した処理液貯留容器106と、基板処理槽101aよりオーバーフローした処理液を処理液貯留容器106に回収する回路142aと、処理液供給路1

07と回路142aとを開閉可能に連通する給排切換弁113aとを具備して成り、薬液処理に際して基板処理槽101aからオーバーフローした処理液を処理液貯留容器6に還流させるように構成されている。

【0006】また、図20(B)の浸漬処理装置は、オーバーフロー型の基板洗浄槽101bと、基板洗浄槽101bに連結した純水供給路103と、純水供給路103に設けた純水導入弁127と、基板洗浄槽101bよりオーバーフローした純水を排水ドレン143に導出する排水路142bと、純水供給路103と排水路142bとを開閉可能に連通する給排切換弁113bとを具備して成り、純水処理に際して基板洗浄槽101bからオーバーフローした排水をドレン143に排出するように構成されている。

【0007】一方、従来例2は図21に示すように、單一の基板処理槽101内に複数種の処理液102を順次供給して基板Wの表面処理を行なうようにしたものである。即ち、処理液102中で複数の基板Wを浸漬して基板Wの表面処理をなすオーバーフロー型の基板処理槽101と、基板処理槽101の下部より複数種の処理液102を供給する処理液供給路103と、処理液供給路103にそれぞれ処理液導入弁108a～108c及び流量調節器107a～107cを介して連通した複数個の処理液貯留容器106a～106c、純水導入弁108a～108c及び流量調節器107a～107cを介して連通した純水供給路106aを備え、各導入弁108a～108cを基板処理槽101へ供給するように構成されている。

【0008】上記処理液貯留容器106a～106cのうち、例えば処理液貯留容器106aには過酸化水素液Q1、106bには塩酸Q2、106cにはフッ化水素液のようエッティング剤Q3などが貯蔵されている。そして、基板処理槽101はこれら複数種の表面処理毎に処理液102の置換が可能なオーバーフロー型の処理槽として構成され、オーバーフローした処理液はドレン(図示省略)へ排出される。

【0009】

【発明が解決しようとする課題】上記基板処理装置150は、各浸漬処理部165a～165fのそれぞれに図20(A)・(B)の浸漬処理装置が配置されることから、装置全体が大型化するという難点がある。また、従来例2は複数の処理液による薬液処理ごとに、基板処理槽101からオーバーフローした処理液をドレンに廻収するので、処理液の消費量が多くなり、基板処理装置全体のランニングコストは高価になる。本発明は、このような事情に鑑みてなされたもので、基板処理装置が大型化するのを防止し、併せてランニングコストの低減を図ることを技術的課題とする。

【0010】

【課題を解決するための手段】請求項1に記載の発明

は、前記課題を解決するために以下の構成を備える。即ち、処理液中に基板を浸漬して基板の表面処理をなすオーバーフロー型の基板処理槽と、上記基板処理槽に連結した処理液供給路と、上記処理液供給路に処理液導入弁及び圧送ポンプを順に介して連通した処理液貯留容器と、上記処理液供給路に純水導入弁を介して連通した純水供給路と、上記基板処理槽よりオーバーフローした排液を排液ドレンに導出する排液路とを具備して成る基板の浸漬処理装置において、上記排液路を分歧して一方は

排液弁を介して排液ドレンに連通するとともに、他方は処理液回収路として処理液回収弁を介して上記処理液貯留容器と、薬液処理では、処理液貯留容器内の処理液を処理液供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から処理液回収弁を介して当該処理液貯留容器に回収し、上記薬液処理の後で行われる純水処理では、純水を純水供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から排液弁を介して排液ドレンに廻収し、上記薬液処理から純水処理への移行に際しては、処理液の供給を停止し、統いて、上記基板処理槽に処理液を入れた状態で純水を供給してオーバーフローさせることにより、上記基板処理槽内の処理液を純水に置き換える、ことを特徴とするものである。

【0011】また、請求項2に記載の発明は、処理液中に基板を浸漬して基板の表面処理をなすオーバーフロー型の基板処理槽と、上記基板処理槽に連結した処理液供給路と、上記処理液供給路に処理液導入弁及び圧送ポンプを順に介して連通した処理液貯留容器と、上記処理液供給路に純水導入弁を介して連通した純水供給路と、上記基板処理槽よりオーバーフローした排液を排液ドレンに導出する排液路とを具備して成る基板の浸漬処理装置において、上記排液路を分歧して一方は排液弁を介して排液ドレンに連通するとともに、他方は処理液回収路として処理液回収弁を介して上記処理液貯留容器に連通し、HF処理では、処理液貯留容器内のHFを処理液供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から処理液回収弁を介して当該処理液貯留容器に回収し、上記HF処理の後で行われる純水処理では、純水を純水供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から排液弁を介して排液ドレンに廻収し、上記HF処理から純水処理への移行に際しては、HFの供給を停止し、統いて、上記基板処理槽にHFを入れた状態で純水を供給してオーバーフローさせることにより、上記基板処理槽内のHFを純水に置き換える、ことを特徴とするものである。

【0012】そして請求項3の発明は、請求項1又は請求項2に記載の基板の浸漬処理装置において、前記処理液供給路の圧送ポンプと前記処理液導入弁との間にフィルタを付設するとともに、処理液導入弁より下流側に純水供給路を連通し、上記処理液供給路の圧送ポンプと純水供給路接続部との間に処理液回収路を接続し、純水

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処理では、圧送ポンプで汲み上げた処理液を処理液回路に流通させて上記処理液貯留容器に還流させる、ことを特徴とするものである。

【0013】

【作用】請求項1の発明では、基板処理槽への処理液供給路に純水導入弁を介して純水供給路を遮断したことから、一つの基板処理槽により薬液処理と純水処理が順次実行されることになる。また、上記排液路を分歧して一方は排液弁を介して排液ドレンに連通するとともに、他方は処理液回路として処理液回路弁を介して上記処理液貯留容器に遮断し、薬液処理では、処理液貯留容器内の処理液が処理液供給路から基板処理槽に供給されてオーバーフローし、上記排液路から処理液回路を介して当該処理液貯留容器に回収され、再び基板処理槽に還流する。つまり、処理液は廃棄されずに再利用される。他方、上記薬液処理の後で行われる純水処理では、純水は純水供給路から基板処理槽に供給されてオーバーフローし、上記排液路から排液弁を介して排液ドレンに廃棄される。そして上記薬液処理から純水処理への移行には、処理液の供給が停止され、引き続き基板処理槽に処理液を入れた状態で純水が供給されてオーバーフローすることにより、上記基板処理槽内の処理液が純水に置き換える。つまり、基板処理槽内では、基板は空気に触れることなく、薬液処理から純水処理へ移行する。

【0014】請求項2の発明においても、基板処理槽への処理液供給路に純水導入弁を介して純水供給路を遮断したことから、一つの基板処理槽により薬液処理と純水処理が順次実行されることになる。また、上記排液路を分歧して一方は排液弁を介して排液ドレンに連通するとともに、他方は処理液回路として処理液回路弁を介して上記処理液貯留容器に遮断し、HF処理では、処理液貯留容器内のHFが処理液供給路から基板処理槽に供給されてオーバーフローし、上記排液路から処理液回路を介して当該処理液貯留容器に回収され、HFは廃棄されずに再利用される。他方、上記HF処理の後で行われる純水処理では、純水が純水供給路から基板処理槽に供給されてオーバーフローし、上記排液路から排液弁を介して排液ドレンに廃棄される。そして上記HF処理から純水処理への移行には、HFの供給が停止され、引き続き上記基板処理槽にHFを入れた状態で純水が供給されてオーバーフローすることにより、上記基板処理槽内のHFが純水に置き換える。つまり、基板処理槽内では、基板は空気に触れることなく、HF処理から純水処理へ移行する。

【0015】請求項3の発明では、請求項1又是請求項2に記載の基板の浸漬処理装置において、前記処理液供給路の圧送ポンプと前記処理液導入弁との間にフィルタを付設するとともに、処理液導入弁よりも下流側に純水供給路を遮断し、上記処理液供給路の圧送ポンプと純水

供給路接続部との間に処理液回路を接続したことから、薬液処理（HF処理を含む、以下同様）及び純水処理が行われている間に、処理液（HFを含む、以下同様）はフィルタリングによりリフレッシュされる（以下単に「フィルタリング」という）。また、純水処理が行われる場合においても、圧送ポンプで汲み上げられた処理液は、フィルタリングされてから処理液回路を流下し、再び処理液貯留容器に還流する。

【0016】

10 【発明の実施の形態】以下、本発明の実施の形態を図面に基づいて説明する。先ず本発明が適用される基板洗浄用の基板処理装置について説明する。図1-6は基板処理装置の概略斜視図、図1-7は同装置の概略平面図、図1-8は同装置の概略断面図である。本基板処理装置50は、後述する浸漬処理部6-5において複数の基板処理槽1を並設して半導体ウエハ（以下単にウエハという）の洗浄処理を行うとともに、基板処理槽1からオーバーフローした洗浄液（以下単に処理液という）を処理液貯留器6に回収してリサイクル可能にしたものである。

20 【0017】図1-6～図1-8に示すように、この基板処理装置50は、基板収容カセットCの搬入搬出部5-1と、カセットCからウエハWを取り出し又はカセットC内へウエハWを装填する基板移載部6-0と、カセットCの搬入搬出部5-1と基板移載部6-0との間にカセットCを移動するカセット移載ロボット5-5と、複数のウエハWを一括して洗浄する浸漬処理部6-5と、ウエハWの波切り基板乾燥部7-0と、基板移載部6-0でカセットCから取り出した複数のウエハWを一括保持して上記浸漬処理部6-5及び基板乾燥部7-0に搬送する基板搬送ロボット7-5とから構成される。

30 【0018】上記カセット移載ロボット5-5は、図1-6～図1-8に示すように、昇降及び回転自在で、矢印A方向に移動可能に構成され、搬入搬出部5-1に搬入されてきたカセットCを基板移載部6-0のテーブル6-1上に移載し、また、洗浄液ウエハWを収容したカセットCを当該テーブル6-1から搬入搬出部5-1へ移載するように構成される。また、上記基板搬送ロボット7-5は、図1-6～図1-8に示すように、矢印B方向に移動可能に設けられ、上記基板移載部6-0のリフター6-4から受け取った複数のウエハWを基板搬送ロボット7-5の基板挟持アーム7-6で保持し、移動部7-7に沿って浸漬処理部6-5内及び基板乾燥部7-0内へ順次搬送するように構成される。

40 【0019】上記浸漬処理部6-5には、以下に述べるよう、本発明に係る各種の浸漬処理装置が配設される。ただし、図1-6～図1-8においては、基板処理槽1を3個並設したものが例示してある。即ち、上記浸漬処理部6-5は、オーバーフロー型の基板処理槽1を3個並設して成り、各基板処理槽1に昇降可能に設けた基板保持具5-6により、前記基板搬送ロボット7-5から受け取った

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複数のウエハWを各基板処理槽1内に順次浸漬可能に構成される。なお、本発明の実施形態に係る浸漬処理装置の具体的な内容については後述する。

【0020】上記基板乾燥部70は、例えば本出願人の提案に係る特開平1-255227号公報に開示したように、ウエハWの主平面の中心近傍を回転中心として、回転達心力で液剤により乾燥する乾燥処理装置7を具備して構成される。なお、この基板乾燥部70は、当該達心式のものに替えて、有機溶剤等を使用した乾燥方式、又はこれに加えて加熱蒸気や被圧による乾燥方式により乾燥を促進するようにして構成される。

【0021】上記基板処理装置50のレイアウトとしては、図16～図18に示すように、クリーンルーム作業域30に臨む前方から保全用作業域31に臨む後方に向かって前記カセットCの搬入搬出部51、基板移載部60、基板乾燥部70及び浸漬処理部65を順番に配置する。また、図16及び図18に示すように、上記浸漬処理部65の3つの基板処理槽1の下部に処理液の給排水配管20を、また、この給排水配管20の下部に洗浄用の処理液貯留容器6を上下3段に配置する。さらには、図16及び図17に示すように、上記基板移載部60・基板乾燥部70・浸漬処理部65の右側に基板搬出ロット7の5つの移動部77を前後方向に形成し、これらの中の空間で、前記基板移載部60よりも後方の空間をメンテナンス・スペース90として形成する。尚、メンテナンス・スペース90の床部には複数の配管、バルブ等が敷設される。

【0022】即ち、上記基板処理装置50では、浸漬処理部6の5基の板処理槽1と、給排水配管室20と、処理液貯留容器6とを上下3段に積み上げ、縦方向にレイアウトするので、これらの積み上げ部の左側に隣んだエアリーメンテナンス・スペース9を確保できる。換言すると、図17に示すように、浸漬処理部6や基板移動部6などの各種作業ブロックを平面配置でし字形状にまとめるにより、基板処理装置50内の余剰空間をメンテナンス・スペース9として設定できる。また、主に浸漬処理部6を縦向きに積み上げることにより、基板処理装置50全体をコンパクトにまとめてクリーンルーム全体の省スペース化を効率良く図れるうえ、当該基板処理装置50の設置部が見渡せるほど、クリーンルームにおけるスペース9の有効利用度が一層高まられる。

【0023】また、上記漫演処理部6 5の基板処理槽1及び基板移載部7 0のレイアウトでは、図16～図18に示すように、保全用作業場3 1に臨む奥側からクリーニングルーム作業域3 0に臨む前側に向かって、3つのオーバーフロー型の基板処理槽1、と乾燥処理部7 0と前記基板移載部6 0とを順番に配列する。即ち、上記基板乾燥部7 0は漫演処理部6 5と基板移載部6 0の間に配置されるので、洗浄処理されたウエハWを可能な限り速く乾燥させ、カセットに戻して搬入搬出部5 1から効率

良く搬出できる。その反面、この基板乾燥工程はカセットCへの戻しに対する時間的制約を強くは受けず、乾燥処理の完了から基板移載部60への戻しの間に待機時間を取るので、作業工程の面で隣接状の基板移載部60に対して乾燥処理部70にバッファ的な役割を担わせることができる。

【0024】また、通常、酸洗浄処理においては昇温した酸を使用するので、酸の蒸気やミストが発生し易いが、例えば、クリーンルーム作業場30から最も遠い奥の基板処理槽1でこの酸洗浄処理を実施する場合には、クリーンルーム作業場30への悪影響を防止して作業の安全性を確保できる。以下、上記浸漬処理部65に配設される各種浸漬処理装置の実施形態について順次説明する。

【0025】図1は本発明の実施形態1に係る浸漬処理装置の概略系統図である。この浸漬処理装置は、図1に示すように、処理液中に複数の基板Wを一括して浸漬し、基板Wの表面洗浄をなす3つの基板洗浄槽1・1・1と、各基板処理槽1の下部より処理液を供給する処理液供給路7と、処理液供給路7に処理液導入弁8及び圧送ポンプ15を順に介して連通した処理液貯留器6と、処理液供給路7に純水導入弁27を介して連通した純水供給路3と、基板処理槽1よりオーバーフローした排水を排水路4・3に導出する排水路4・2とを具備して成る。即ち、各基板処理槽1では夫々所定の処理液Q1～Q4により後述する要素処理が別々に行われる。

【0026】上記基板処理槽1は、図1に示すように、石英ガラス製で側面視野V字状・平面規制枠形状に形成され、その下部に処理液供給路7を連結しており、基板処理槽1内に処理液の均一な上昇流を形成して基板Wを表面処理するとともに、処理液を複数種の洗浄処理毎に、迅速に置換し得るオーバーフロー構造として構成される。当該基板処理槽1は石英ガラス製に限らず、例えは、石英ガラスを耐食させてしまうHCl酸に用いる場合には、耐食性を有する四フッ化エチレン樹脂等の樹脂製材料で形成したものでも良い。また、浸漬処理部6.5には4~5以上のオーバーフロー型基板処理槽1を設置しても差支えない。

【0027】処理液を供給するための構成は、図1に示すように、各基板処理部1の下部に並列に連結した処理液供給路7と、処理液供給路7に処理液導入部8及び圧送ポンプ15を介して連結した処理液貯留容器6と、上記処理液供給路7に純水導入弁2と7を介して連結した純水供給路3及び純水供給源（図示省略）とを具備して構成される。なお、上記純水供給路3は常に一定温度で加熱した純水D₁を、供給する純水の主要通路となるが、純水D₁は基板表面酸化皮膜を防ぐうえで、脱酸素処理を施したものを使いするのが好い。

【0028】上記処理液導入弁8を開弁すると、処理液貯留容器6内の処理液が圧送ポンプ15で基板処理槽1

に圧送され、基板処理槽1よりオーバーフローされ、薬液処理が行われる。また、上記純水導入弁27を開弁すると、純水D₁が純水供給路3から基板処理槽1に供給され、オーバーフローして純水処理が行われる。即ち、処理液導入弁8と純水導入弁27との切り替換操作で処理液Q₁～Q₆と純水D₁を処理液供給路7に選択的に供給可能に構成される。なお、上記処理液貯留容器6には、処理液Q₁～Q₆が自動的に補充可能に構成されている。

【0029】処理液Q₁～Q₆を排出するための構成は、図1に示すように、各基板処理槽1の上側部に付設したオーバーフロー液回収部41と、オーバーフローした処理液を排出する排液路42と、基板処理槽1の底部から当該排液路42に給排切換弁13を介して導出した連通路4とを具備して成る。上記排液路42の下流側手側を二股状に分歧して、その一方を排液弁47を介して排液ドレン43に接続し、その他の方を処理液供給路22として処理液回収弁44を介して前記処理液貯留容器6に接続する。なお、上記給排切換弁13は、必要に応じて基板処理槽1内の各処理液Q₁～Q₆を排液路42へ導出するためのものである。

【0030】本実施形態1では、図1に示すように、各基板処理槽1の下部には、各処理液貯留容器6から導出した処理液供給路7が処理液導入弁8を介して接続されており、所定の処理液Q₁～Q₆が各処理液貯留容器6から各基板処理槽1に夫々供給される。また、各基板処理槽1の下部には純水供給路3が純水導入弁27を介して接続されており、純水D₁が各基板処理槽1に夫々供給可能になっている。そして、基板処理槽1の上部から導出した排液路42の下流側は、処理液回収弁44を介して運送された処理液貯留容器6の側と、排液弁47を介して運送された排液ドレン43の側との2方向に分歧されている。このため、図1の処理液Q₁について述べると、処理液貯留容器6内の処理液Q₁は、処理液供給路7から各基板処理槽1にオーバーフローしてウエハWを洗浄した後、排液路42から処理液回収弁44を介して処理液貯留容器6に回収され、基板処理槽1にリサイクルされる。

【0031】一方、薬液処理の後で行われる純水処理では、純水D₁が純水供給路3から基板処理槽1に供給されてオーバーフローされ、排液路42から排液弁47を介して排液ドレン43に廻収される。なお、処理液Q₁及びQ₆についても同様に基板処理槽1から回収可能に構成される。従って、基板処理槽1からオーバーフローした各処理液Q₁～Q₆は、処理液回収弁44を介して処理液貯留容器6に回収されて再利用されるので、複数種の薬液処理毎に処理液を廻収する従来例2に比べて処理液の消費量を効果的に抑制して、基板処理装置全体のランニングコストを低減できる。

【0032】また、この浸漬処理装置では、図1に示す

ように、並設した3つの基板処理槽1にウエハWを順次浸漬して複数種の処理液Q₁～Q₆で並行処理するのでスループットが向上する。しかも、この浸漬処理装置では処理液を基板処理槽1の上部からオーバーフローさせるので、薬液処理から純水処理に移行する際には、基板処理槽1内の洗浄液を全部排出せども薬液を純水に置換することが可能であり、薬液処理及び純水処理が完了するまでウエハWは空気に触れない。このため、ウエハ表面に酸化皮膜が形成されたり、空気中の不純物が付着したりする虞れはない。また、基板処理槽1内の洗浄液を全部排出せどもウエハWの表面や取り出しができる。

【0033】次に上記実施形態1における薬液処理の内容について一例を挙げて説明する。第1番目の基板処理槽1ではS_C処理を行う。処理液Q₁としては調製したアンモニア(NH₃OH)と過酸化水素(H₂O₂)と純水D₁との混合液を使用する。処理液Q₁による薬液処理の後で純水処理を実施し、ウエハWの表面に付着したフォトレジスト等の有機物を除去する。なお、S_C処理に代えてCARO処理を行う場合もある。この場合の処理液Q₁としては硫酸過水を用いる。

【0034】また、第2番目の基板処理槽1ではS_C処理を行う。処理液Q₂としては調製した塩酸(HCl)1)と過酸化水素(H₂O₂)と純水の混合液を使用する。同様に処理液Q₂による薬液処理の後で純水処理を実施し、ウエハWの表面に付着した金属イオンを除去する。さらに、第3番目の基板処理槽1ではHF処理を行う。処理液Q₃としてはフッ化水素の5.0%水溶液を使用し、ウエハWの表面の未露出部分等をエッチングする。なお、上記フッ化水素に代えてリン酸過水を用いる場合もある。

【0035】ウエハの洗浄処理をふくむ表面処理は、その製造工程により一様ではなく、第1番目～第3番目の基板処理槽1に順次浸漬するとは限らない。ちなみに、その類型として例えば下記(1)～(4)のような種々の表面処理が可能である。

- (1) S_C処理→HF処理→S_C処理
- (2) HF処理→S_C処理→S_C処理
- (3) S_C処理→S_C処理
- (4) その他 HF処理のみ、又はS_C処理のみ。

上記薬液処理の類型は、後述する実施形態においても同様に適用できるものであり、重複する説明は省略する。

【0036】なお、いずれかの薬液処理においてHF処理が含まれる場合には、HF処理した後にウエハWを空気に接触させると、HF、O₂とSi₃N₄とが反応し、ウエハWの表面に不純化合物が生じてパーティクルとなる。このため、HFを基板処理槽1に供給して循環した後、HFの供給を停止し、統いて、基板処理槽1にHFを入れた状態で純水を供給し、オーバーフローさせることによりHFを純水に置き換えていく。これにより、ウエハWは常に液中にとどまり、純水の連続供給によりHF成

分はパーティクルを発生することなく除去される。

【0037】上記純水による最終リソス処理では、純水の比抵抗値を検出したり、一定時間の経過により、純水処理が完了するように構成される。また、最終リソスが完了した後に基板処理槽1からウエハWを引き上げる場合には、浮遊したパーティクルがウエハWに付着するのを防止するため、純水をオーバーフローさせながら行う。

【0038】なお、上記実施形態1における利点として、単一の基板処理槽1を用いて薬液処理と純水処理とを実施することにより基板処理槽1の個数を減らして基板処理装置の大型化を防止できる点、各処理液Q₁～Q₆を処理液貯留容器6に收回して再利用することによりランニングコストを低減できる点、薬液処理から純水処理に移行する際に基板処理槽1内の処理液を全部排出しないで処理液を純水に置換することによりウエハ表面に酸化皮膜が形成されるのを防止できる点が挙げられるが、これらの利点は、後述する実施形態2～実施形態11においても同様であり、重複する説明は省略する。

【0039】図2は本発明の実施形態2に係る浸漬処理装置の概略系統図である。この浸漬処理装置は、図2に示すように、前記浸漬処理部6に配設される3つの基板処理槽1のうちの1槽を、純水処理専用の基板処理槽に設定したものである。即ち、リソス専用槽1の下部から純水供給路3を導出し、純水供給路3に純水導入弁27を介して純水供給源(図示せず)を接続するとともに、リソス専用槽1の上部から排液路42を導出し、排液路42に排液弁47を介して排液ドレン43を接続して、純水D₁がリソス専用槽1に供給され、オーバーフローしてウエハWを純水処理するとともに、排液路42から排液弁47を介して排液ドレン43に廻収されるように構成されている。

【0040】本実施形態2では、2個の基板洗浄槽1の夫々で処理液Q₁又はQ₂による薬液処理が施された後、引き続いて軽く純水処理が行なわれるが、さらに別途に上記リソス専用槽1で純水D₁による純水処理が行われる。このため、実施形態1のように各基板処理槽1で薬液処理と純水処理とを行う場合に比べて、強力にウエハWをリソスでき、純水処理の所要時間が短縮されるとともに、スループットが向上する。

【0041】図3は本発明の実施形態3に係る浸漬処理装置の概略系統図である。この浸漬処理装置は、基板洗浄装置50の浸漬処理部65に単槽の基板処理槽1を配設したもので、前記実施形態1又は実施形態2と同様に、基板処理槽1に供給されてオーバーフローする処理液を処理液回収路22と処理液回収弁44を介して処理液貯留容器6に收回して再利用可能に構成するとともに、基板処理槽1よりオーバーフローした純水D₂を排液ドレン43に廻収するように構成する。この実施形態3においても、処理液の消費量を抑制するとともに、

基板処理槽1の単槽化で基板処理装置50全体をコンパクトにまとめられる。

【0042】図4は本発明の実施形態4に係る浸漬処理装置の概略系統図である。この実施形態4は、複数の処理液貯留容器6を切り換える可能に接続したものである。この浸漬処理装置は、処理液を基板処理槽1から処理液貯留容器6に循環させて再利用可能にした点は前記実施形態1～3と同様であるが、前記実施形態1が3つの基板処理槽1で3種類の薬液処理を別々に行なうに対して、本実施形態4は1つの基板処理槽1内で3種類の薬液処理を順番に行なうようにして、複数種の薬液処理に対して基板処理槽1を共用化した点に特徴がある。

【0043】即ち、図4(A)に示すように、3種類の処理液Q₁・Q₂・Q₃の各処理液貯留容器6から各処理液導入弁81・82・83を介して処理液供給路7を1個の基板処理槽1の下部に接続する。ここで、上記処理液導入弁81・82・83は、処理液選択弁82でもある。また、図4(B)はこの処理液の供給側において、各処理液を供・断する処理液導入弁81・82・83及び純水導入弁27が集合した導入弁連絡路16を示し、当該連絡路16の一端16aには純水供給路3が接続され、その他端16bには処理液供給路7が接続される。

【0044】上記基板処理槽1の排液路42の下流側を弁44に分岐し、これらの方を排液ドレン43に対して接続し、他方を処理液回収路22(具体的には22a・22b・22c)として上記3種類の処理液Q₁・Q₂・Q₃の処理液貯留容器6に対して接続する。オーバーフローした各種の処理液を処理液貯留容器6に回収するとともに、必要に応じて排液ドレン43に廻収できるよう構成する。図4(C)はこの処理液の排出側において、各処理液を供・断する処理液回収弁44・44a・44b及び排液弁47の集合した排液路42の要部を示し、排液路42の下流側の最奥部42aには純水用の上記純水導入弁47が設けられる。ここで、上記処理液回収弁44a・44b・44cは、処理液選択弁83でもある。

【0045】一方、上記基板処理槽1への各処理液Q₁～Q₃の圧送手段25は、図4(A)に示すように、各処理液貯留容器6(具体的には6～6₁)から導出した処理液供給路7(具体的には7₁～7₆)に設けた1個の圧送ポンプ15と、圧送ポンプ15を駆動するモータ19と、圧送ポンプ15の吐出側に設けた圧力検出器26(具体的には、圧力計)と、圧力検出器26からの検出信号に基づいて圧送ポンプ15の回転数を増減制御する制御手段12とから構成される。当該圧送手段25では、設定圧に対する過不足を圧力検出器26で検出し、当該制御手段12が圧送ポンプ15の駆動モータ19を駆動制御して、基板処理槽1に所定の設定圧で処理液が圧送される。

【0046】ウエハWを洗浄する場合には、まず処理液

Q₄を処理液導入弁4-1を介して基板処理槽1に循環させてオーバーフローさせつつウエハを蒸気処理する。引き続きその後で処理液Q₁を給排水切換弁1 3及び排液路4-2の処理液回収弁4-4を介して処理液貯留容器6に回収する。そして空になった基板処理槽1に純水導入弁2-7を介して純水D₁を供給して純水処理に移行する。純水をオーバーフローさせながらウエハWをリンスした後、純水を排出する。処理液Q₁・Q₂についても、処理液Q₁の場合と同様に循環させて蒸気処理した後、ウエハWを基板機架構造1から取り上げる。

【0047】上記純水処理では、基板処理槽1からオーバーフローした純水排液を排液槽4.7を介して排液ドレン4.3に廃棄する。その際、純水排液は排液路4.2の最奥部4.2aから排出されるので、排液路4.2の内壁に残る処理液は効有に洗流される。また、基板処理槽1の底部の排出口4.5及び給排液切換弁1.3はクイックドレンに構成され、急速排水によりスループットを高めている。なお、いずれかの薬液処理においてHF処理が含まれる場合には、前記のように基板処理槽1にHFを入れた状態で純水を供給し、オーバーフローさせることによりHFを純水に置換するとともに、最終リンスが完了した後に基板処理槽1から基板Wを引き上げる場合には、純水をオーバーフローさせながら行う。

〔0048〕図5は本発明の実施形態5に係る浸漬処理装置の概略系統図を示し、同図(A)中の太線は薬液処理の場合の処理液経路を、同図(B)中の太線は純水処理の場合の純水経路及び処理液経路を示す。この浸漬処理装置は、前記浸漬処理部5に单一の基礎処理槽1を配設するとともに、薬液処理及び純水処理が行われる間に処理液の循環フィルタリングと温度調整とを実行するためのものである。即ち、図5(A) (B)に示すように、処理液供給路7の処理液導入弁8と排液路4の排液弁47とを、それぞれ切換可能な三方弁で構成する。

【0049】上記排液路42の流通下手側を二股状に分歧して、一方の管路21を排液ドレン43に接続し、他方を処理液回収路22として処理液貯留容器6に接続する。そして処理液導入弁8よりも下流側に純水供給路3を連通とともに、圧送ポンプ15と処理液導入弁8との間にフィルタ10とインライン型のヒータ（以下「インラインヒーター」という）81とを付設し、処理液供給路7と処理液回収路22とを切換可能な処理液導入弁8を介して接続する。

【0050】薬液処理が行われる場合には、図5(A)に示すように、基板処理槽1からオーバーフロー液回収部41へオーバーフローした洗浄液は、液回収路2/2'を経て処理液貯留容器6に回収され、再び圧送ポンプ15により吸い上げられ、フィルタ10により濾過されてリフレッシュされた後、基板処理槽1に還流する。また、純水処理が行われる場合には、図5(B)に示すように、オーバーフローした純水は切替可能な純水路4/4'及び

び排液路 2-1 を介して排液ドレン 4-3 に排出される。

【0051】この純水処理において、圧送ポンプ15で汲み上げられた処理液は、フィルタ10により濾過されてリフレッシュされた後、切换可能な処理液導入弁8を介して処理液回収路22に流入し、再び処理液貯留槽6に運搬する。上構成により单一の基板搬送機1を用いる場合でも、薬液処理及び純水処理が行われる間に処理液の循環フィルタリングが行われ、処理液をリフレッシュさせることができる。また、前記インランピング81は、例えば管路の外周にヒータを配設した構成を具備し、管路を通過する処理液を加熱する。このため、上述した純水処理においても循環する処理液を均一な温度に調整しておくことができ、特に高温薬液処理を行う場合に、所定温度の処理液を基板処理室内に供給して直ちに洗浄処理に移行することができる。

【0052】図6は本発明の実施形態6に係る浸漬処理装置の概略系統図を示し、同図(A)中の太線は液相処理の場合の処理液循環経路を、同図(B)中の太線は純水処理の場合の純水経路及び処理液循環経路を示す。この浸漬処理装置も実施形態5(図5)と同様に処理液の循環フィルタリングと温度調整とを実行するものである。即ち、図6(A)(B)に示すように、実施形態5(図5)の浸漬処理装置において、上記処理液回路22に切換可能な処理液回収弁44を付設するとともに、処理液供給路7の送込ポンプ上流側と処理液回路22を上記処理液回収弁44を介して接続する。

【0053】薬液処理が行われる場合には、図6(A)に示すように、基板処理槽1のオーバーフロー液回収部4から、処理液は排液弁47を介して処理液回路2を循環し、処理液貯留器6を介す上記処理液回収部4を流下し、処理液供給路7に流入し、フィルタ10により濾過されてリフレッシュされるとともに、温度調整された後、再び基板処理槽1に還流する。一方、純水処理が行われる場合には、図6(B)に示すように、圧送ポンプ15で汲み上げられた処理液は、フィルタ10によりリフレッシュされるとともに、温度調整された後、処理液回路2を循下し、上記処理液回収部4を介して処理液貯留器6に導入する。

【0054】上記実施形態6においては、液被処理が行われる際には、処理液は圧送ポンプ15で吸引されて処理液回収路22を流下することになるので、処理液回収路22の管径が細くても單に落差で流下する施設構造5と比較して流下する処理液の流量は格段に多くなる。つまり、処理液回収路22は管径の細いもので足りるという利点がある。

【0055】図7は本発明の実施形態7に係る浸漬処理装置の概略系統図を示す。この実施形態7は、実施形態6(図6)と同様の浸漬処理装置を3組並設して構成したものである。この実施形態7では、図7に示すように各基板処理槽1においてそれぞれ所定の処理液Q₁～Q₄

により前記類型の薬液処理が別々に行われ、ウエハWを表面処理した各処理液Q₁～Q₆は、各処理液貯留容器6に回収され再利用される。また、循環フィルタリングにより各処理液Q₁～Q₆をリフレッシュさせることやインラインヒータ81により各処理液Q₁～Q₆の温度調整を行うこともできる。

【0056】図8は本発明の実施形態8に係る浸漬処理装置の概略系統図を示す。この浸漬処理装置は、実施形態7(図7)において基板処理槽1のうちの1槽を、純水処理用のリンス専用槽に設定したものであり、他の2組において、薬液処理及び純水処理が行われる間に処理液の循環フィルタリングや温度調整を実行する点は実施形態6(図6)と同様である。この実施形態8では、2個の基板処理槽1の夫々で処理液Q₁又はQ₂による薬液処理が施された後、引き続き軽く純水処理が行なわれ、さらにリンス専用槽1で純水D₁による純水処理が行われる。これにより、各基板処理槽1で薬液処理と純水処理を順次行う場合に比べて、強力にウエハWをリンスでき、純水処理の所要時間が短縮されてスループットが向上する。

【0057】図9及び図10は本発明の実施形態9に係る浸漬処理装置の概略系統図を示し、図9中の太線は薬液処理の場合の処理液循環経路を、図10中の太線は純水処理の場合の純水循環及び処理液循環経路を示す。この実施形態9は、単一の基板処理槽1を用いる点で、また、薬液処理及び純水処理が行われる間に処理液の循環フィルタリングや温度調整を実行する点で実施形態6(図6)と共通する。

【0058】この実施形態9では、図9及び図10中の処理液供給路7のうち、そのポンプ上流側の開閉弁9と処理液導入弁8との間は、処理液回収時ににおいて処理液回収路2をも兼ねる。図9において、薬液処理が行われる場合には、処理液供給路7の上記開閉弁9と処理液導入弁8と、排液路4の切り換え可能な排液弁47aが開弁され、その他の弁は閉弁される。処理液Qは基板処理槽1内に満たされた十分にオーバーフローするまで圧送ポンプ1より汲み上げられる。

【0059】その後処理液供給路7のポンプ上流側の開閉弁9は閉止される。基板処理槽1からオーバーフローした処理液Qは、オーバーフロー回収路41から排液路42及び排液弁47aを介して処理液回収路2を流下し、処理液貯留容器6を介さないで処理液供給路7のポンプ上流側に流入し、再び圧送ポンプ15で汲み上げられ、フィルタ10により濾過されてリフレッシュされた後、基板処理槽1に還流する。つまり、基板の薬液処理が行われる間に処理液の循環フィルタリングが行われる。

【0060】薬液処理が終了すると、処理液供給路7の上記開閉弁9と処理液導入弁8は閉弁され、排液路42の排液弁47a及び処理液供給路7と処理液回収路2を介して

とを遮断する給排液切換弁13が開弁される。さらに、圧送ポンプ15と処理液導入弁8との間に導出された後段の処理液回収路22aが処理液回収弁44を介して処理液貯留容器6に遮断され、その他の弁は閉弁される。そして基板処理槽1内の処理液Qは、処理液回収路22→処理液供給路7の上流側→圧送ポンプ15→後段の処理液回収路22a→処理液回収弁44を経て処理液貯留容器6内に回収される。

【0061】図10において、処理液の回収を終えて純水処理に移行する場合には、上記開閉弁9が閉弁され、給排液切換弁13は閉弁され、排液路42の排液弁47aは排液ドレン43a側に切り換えられる。処理液貯留容器6内に回収された処理液Qは、圧送ポンプ15で汲み上げられ、フィルタ10→上記処理液回収路22a→処理液回収弁44を介して循環フィルタリングが行われる。

【0062】次いで、給排液切換弁13は閉弁され、排液路42の第1排液弁47aは排水用のドレン43a側に切り換えられ、純水供給路3aの純水導入弁27が閉弁される。純水D₁は基板処理槽1内に満たされたオーバーフローしつつ、ウエハをリンスする。基板処理槽1からオーバーフローした純水D₁は、オーバーフロー回収路41→排液路42→第1の排液弁47a→第2の排液弁47b→排水用排水路21aを経て排水用ドレン43aに排出される。そしてウエハの純水処理の間も処理液の循環フィルタリングが行われる。

【0063】この実施形態9は、上述した循環フィルタリングの他に、下記のような豊富な機能を備えている。図9及び図10に示すように、上記基板処理槽1は排液槽2内の超音波洗浄器34の上側に設置されており、超音波発振器35により超音波洗浄部34を介してウエハを強力に洗浄することができる(以下、超音波洗浄機能という)。上記純水供給路3は、処理液供給路7に接続される純水導入路3aとシャワーパイプ17に接続されるシャワーライナ入路3bとに分岐され、純水導入路3aには純水導入弁27が付設され、シャワーライナ入路3bには同様のユニット弁28が付設される。この純水シャワーライナは、薬液処理をする前にウエハを純水で軽く洗浄する場合に用いられる(以下純水シャワーライナ機能という)。なお、ユニット弁27・28からの余剰の純水は後述する純水回収用ドレン43bに分離排出される。

【0064】上記排液路42は、切り替え可能な第1排液弁47aを介して排水路21と処理液回収路22とに分岐される。上記排水路21は第2排液弁47bを介して排水用排水路21aと回収用排水路21bに分岐される。排水用排水路21aは排水用ドレン43aに、回収用排水路21bは純水回収用ドレン43bに接続される。上記基板処理槽1には急速排水用のクイックドレン弁32が付設されており、純水排液を基板処理槽1から

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排出する際には、クイックドレン弁32を閉めて純水排液を排液槽2内に流下させ、第1排液弁47aと第2排液弁47bを適宜切り換えて操作して排水用ドレン43a又は純水回収用ドレン43bに分離排出させる（以下排水の分離排出機能という）。

【0065】上記処理液供給路7は、純水導入路3aの接続部と処理液導入弁8との間ににおいて、給排切換弁13を介して処理液回収路22に連通され、処理液回収路22の下端は処理液供給路7に付設された開閉弁9と圧送ポンプ15との間に連通される。さらに、圧送ポンプ15と処理液導入弁8との間ににおいて、後段の処理液回収路22aと処理液排液路21cとが連通される。後段の処理液回収路22aは処理液回収弁44を介して処理液貯留容器6に連通され、処理液排液路21cは第3排液弁47cを介して処理液回収用ドレン43bに接続される。

【0066】処理液Qを処理液貯留容器6に回収する場合には、前記のように、基板処理槽1→処理液供給路7→給排切換弁13→処理液回収路22→圧送ポンプ15→フィルタ10→第2の処理液回収路22a（処理液回収弁44）を経て処理液Qを処理液貯留容器6に回収する。また、用尽した処理液Qを廃棄する場合には、上記処理液回収路22aの処理液回収弁44を開弁するとともに第3排液弁47cを開き、圧送ポンプ15により処理液Qを処理液回収用ドレン43cに排出する。これにより、処理液Qは処理液貯留容器6と処理液回収用ドレン43cとに分離排出される（以下処理液の分離排出機能という）。

【0067】上記基板処理槽1及び処理液貯留容器6内には恒温ヒータ5が浸漬配管され、上述した循環フィルタリングと相俟て処理液を均一な温度に調節できる（以下処理液の恒温維持機能という）。これにより、特に高温度処理においては、所定温度の処理液Qを基板処理槽1内に供給して直ちに洗浄処理を可能にし、スループットが向上する。また、上記基板処理槽1内にバーバーフロー仕様2が設置され、基板の洗浄処理に際して、ガス供給路23よりN₂ガスを供給して均一な処理液Qの均一な上昇流を形成するとともに、洗浄処理を促進する構成がされている（以下処理液のバーバーフロー機能という）。このガス供給路23には、ガス導入用のユニット弁37とガスフィルタ38が付設されている。

【0068】上記処理液貯留容器6には、複数の薬液導入弁48a・48b・48cを介してそれぞれ薬液q₁・q₂・q₃を注入し得る構成がされており、これらの薬液q₁・q₂・q₃を混合して所要の処理液を作成することができる（以下処理液の調合機能という）。なお、上記基板処理槽1及び処理液貯留容器6には、処理液Qの液面レベルや残量、温度等を検出する各種の検知器18が設けられている。

【0069】図11、図12及び図13は、それぞれ本発明の実施形態10に係る浸漬処理装置の概略系統図を示し、図11中の太線は薬液処理の場合の処理液供給経路を、図12及び図13中の太線はそれぞれ純水処理の場合の純水経路及び処理液貯留経路を示す。この浸漬処理装置は、単一の基板処理槽1に対して処理液の異なる複数の処理液貯留容器6a・6bを設け、処理液供給路7a・7b及び処理液回収路22a・22bを各処理液貯留容器6a・6bに対して切り換える構成とした点が上記実施形態9と基本的に異なる。

【0070】この実施形態10では、実施形態9と同様に処理液供給路7の一部分（開閉弁9aと処理液導入弁8との間）が、処理液回収路22をも兼ねる。また、上記処理液供給路7に複数の処理液貯留容器6a・6bを切り換える接続する開閉弁9a・9bは、処理液導入弁8aでもある。さらに、処理液回収路22を兼ねる処理液供給路7の一部分（開閉弁9aと処理液導入弁8との間）に複数の処理液貯留容器6a・6bを切り換える接続する処理液回収弁44a・44bは処理液選択弁8aでもある。

【0071】上記基板処理槽1及びオーバーフロー回収部41にそれぞれ急速排水用のクイックドレン弁32、33が付設されており、基板処理槽1及びオーバーフロー回収部41を空にする場合には迅速に排水し得るよう構成されている。また、フィルタ10の一次室と記載オーバーフロー回収部41とが、連通路85により逆止弁86を介して連通されており、フィルタ10の目詰まりが生じた場合には、処理液をオーバーフロー回収部41に圧送し得るよう構成されている。

【0072】図11において、処理液Q₁による薬液処理が行われる場合には、処理液供給路7上流側の第1の開閉弁9aと、処理液導入弁8と、その下流側の開閉弁14と、切り換える第1排液弁47aが閉弁され、その他の弁は開弁される。処理液Q₁は基板処理槽1内に満たされて十分にオーバーフローするまで圧送ポンプ15より汲み上げられ、その後開閉弁9aは閉弁され、第1排液弁47aは開弁される。基板処理槽1からオーバーフローした処理液Q₁は、オーバーフロー回収部4→排液路42→第1排液弁47a→処理液回収路22→処理液供給路7のポンプ上流側→圧送ポンプ15→フィルタ10→処理液導入弁8→開閉弁14を経て基板処理槽1を還流する。つまり、処理液の循環フィルタリングを実行しつつエバヘの薬液処理が行われる。

【0073】薬液処理が終了すると、処理液供給路7上流側の開閉弁9a・9bと処理液導入弁8は閉弁され、排液路42の第1排液弁47aと、処理液供給路7と処理液回収路22とを連通する給排液切換弁13が開弁される。さらに、圧送ポンプ15と処理液導入弁8との間ににおいて導出された別の処理液回収路22aが処理液回収弁44を介して処理液貯留容器6に連通される。その

他の弁は閉弁され、基板処理槽1内の処理液Qは処理液貯留容器6内に回収される。

【0074】処理液の回収を終えて純水処理に移行する場合には、図12に示すように、開閉弁9 aが開辶され、給排液切換弁1 3は閉辶され、排液路4 2の第1の排液弁4 7 aは排水用ドレン4 3 a側に切り換えられる。処理液貯留容器6内に回収された処理液Q₄は、圧送ポンプ1 5で汲み上げられてフィルタ1 0、第2の処理液回路2 2 aを介して循環フィルタリングが行われる。次いで給排液切換弁1 3は開辶され、排液路4 2の第1の排液弁4 7 aは排水用のドレン4 3 a側に切り換えられ、純水供給路3 aの純水導入弁2 7が開辶され、純水D₄は基板処理槽1内に溝たされてオーバーフローし、基板Wをリinsする。基板処理装置1からオーバーフローした純水D₄は、オーバーフロー回収部4 1→排液路4 2→第1の排液弁4 7 a→第2排液弁4 7 bを経て排水用ドレン4 3 aに排出される。そして基板の純水処理の間も処理液Q₄の循環フィルタリングが行われる。

【0075】図13において、処理液Q₁による薬液処理が行われる場合には、上記基板処理槽1に連通する後段の処理液供給路7bに対して別個の開閉弁19b(処理液供給弁82Z)を介して処理液貯蔵容器6₁が接続され、この処理液貯蔵容器6₁に対して別個の処理液回収弁4₄b(処理液選択弁83)を介して処理液回取路22bが接続される。つまり、エウエハの薬液処理が行われる時には、図11に示すとの同様に、処理液の循環フィルタリングが実行され、エウエハの純水処理が行われる時には、図13において処理液Q₁の循環フィルタリングが実行される。なお、この実施形態1においても、実施形態9(図9)と同様に超音波洗浄機能、純水シャワー機能、純水の分離排出機能、処理液の分離排出機能、及び処理液循環装置を備えず、上に構成されている。

【0076】図14及び図15は、それぞれ本発明の実施形態11に係る浸漬処理装置の概略系統図を示し、図14中の太線は酸素処理の場合の処理液循環路を、図15中の太線は純水処理の場合の純水循環及び処理液循環路を示す。この浸漬処理装置は、複数の基板処理槽11、11にに対して処理液の異なる複数の処理液貯蔵容器61、61を設け、処理液供給路71、71及び処理液回路22a、22bを各基板処理槽11、11及び処理液貯蔵容器61、61にに対して切り替え可能に構成した点が上記実施形態10と異なり、その他の点は実施形態10と同様に構成されている。なお、既述の部材については同様に構成されている。なお、既述の部材については同様に構成されている。

【0077】この浸液処理装置では、図14に示すように、各基板処理槽1においてそれぞれ処理液Q₁、及び処理液Q₂による薬液処理と純水処理を選択的に並行して行われる。その場合の薬液処理や純水処理は、実施形態10に準じて行われる。即ち、薬液処理が行われる場合には、図14に示すように、各処理液Q₁・Q₂はそ

これらの基板処理槽 1 内に満たされた、オーバーフローした処理液 Q₁、Q₂は、オーバーフロー回収部 4.1 → 排液部 4.2 → 第1排液弁 4.7 a → 治理液回収槽 2.2 → 排液供給路 7 のポンプ上流側→圧送ポンプ 1.5 → フィルタ 1.0 → 処理液導入弁 8 → 開閉弁 1.4 を経て基板処理槽 1 連続流する。つまり、処理液の循環フィルタリングを実行し、ツッカウェイの洗浄機能が行われる。

【0078】処理液の回収を終えて純水処理に移行する場合には、図15に示すように、各基板処理槽1内の処理液Q1・Q2はそれぞれ処理液貯留容器6・6内に回収される。処理液貯留容器6・6内に回収された処理液Q1・Q2は、それぞれ圧送ポンプ15で洗み上げられて、フィルタ10と後段の処理液回収路22aを介して循環フィルタリングが行われる。純水D₁はそれぞれの基板処理槽1内に満たされたオーバーフローしつつ、ウエハをリンスする。各基板処理槽1からオーバーフローした純水D₁は、それぞれオーバーフロー回収部41→排液路42→第1の排液弁47a→第2排液弁47bを介して排水用ドレン管43aに排出される。そしてウエハの純水処理の間も処理液Q1・Q2の循環フィルタリングが行われる。

【0079】上記実施形態11では、2つの基板処理槽と2つの処理液貯留器を選択的に接続するのにについて示したが、それらの基板処理槽と処理液貯留器をさらに増やすこともできる。その場合には各基板処理槽により複数の液処理を並行して実行できるので、一層スループットが向上するまた、各基板処理槽において処理液Q₁及び処理液Q₂による液処理と純水処理が適宜選択的に並行して行われるものとして説明したが、各基板処理槽にそれぞれ専用の液処理を行うようにしてもよい。

【0080】
【発明の効果】請求項1及び請求項2の発明では、前記のように構成され作用することから、基板処理槽にオーバーフローした処理液は、処理液回収弁及び処理液回収路を介して処理液貯留器に回収され、再び基板処理槽に循環して再利用できるので、処理液の消費量が大幅に減らすことができる。また、單一の基板処理槽で薬液処理と純水処理を実行できるので、基板処理装置の小型化を防止することができる。さらには、薬液処理から純水処理への移行に際して、基板処理槽に処理液が入った状態で純水を供給してオーバーフローさせることにより、処理液を純水に置き換えるので、基板は空気に触れることなく、薬液処理から純水処理へ移行することができる。これにより、基板表面に酸化皮膜が形成されるのを防止できる。

【0081】請求項3の発明では、前記のように構成され作用することから、薬液処理及び純水処理が行われる間に処理液はフィルタリングにより効果的にリフレッシュ

【画面の簡単な説明】

【図1】実施形態1に係る浸漬処理装置の概略系統図を示す。

【図2】実施形態2に係る浸漬処理装置の概略系統図を示す。

【図3】実施形態3に係る浸漬処理装置の概略系統図を示す。

【図4】図4(A)は実施形態4を示す浸漬処理装置の概略系統図であり、図4(B)は図4(A)のB部を、図4(C)は図4(A)のC部を夫々示す液通路の要部縦断面図である。

【図5】実施形態5に係る浸漬処理装置の概略系統図を示す。

【図6】実施形態6に係る浸漬処理装置の概略系統図を示す。

【図7】実施形態7に係る浸漬処理装置の概略系統図を示す。

【図8】実施形態8に係る浸漬処理装置の概略系統図を示す。

【図9】実施形態9に係る浸漬処理装置の概略系統図を示す。

【図10】実施形態9に係る浸漬処理装置の概略系統図

【図11】実施形態10に係る浸漬処理装置の概略系統図を示す。

【図1-3】実施形態1.0に係る過渡処理装置の概略系統

図を示す。

【図13】実施形態10に係る浸漬処理装置の概略系統図を示す

【図1.4】実施形態1.1に係る浸漬処理装置の概略系統図を示す

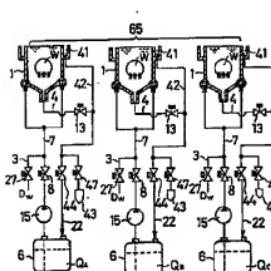
【図1.5】実施形態1.1に係る浸漬処理装置の概略系統図を示す。

【図16】本発明の浸漬処理装置を適用した基板処理装置の概略斜視図である

10 【図 17】同基板処理装置の概略平面図である。
【図 18】同基板処理装置の概略断面図である。
【図 19】従来技術に属する基板処理装置の概略平面図である。
【図 20】従来例 1 に係る浸漬処理装置を示し、同図(A)は薬液処理の概略系統図、同図(B)は純水処理の概略系統図である。
【図 21】従来例 2 を示す浸漬処理装置の概略説明図である。
【符号の説明】

20 1…基板処理槽、3…純水供給路、6…処理液貯留器、7…処理液供給路、8…処理液導入弁、1、5…圧送ポンプ、2、2…処理液回収路、27…純水導入弁、4、4…排液路、4、3…排液ドレン、4、4…処理液回収弁、4…排液弁、D…純水、QA～QE…処理液、W…基板。

四〇三



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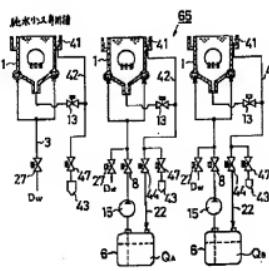
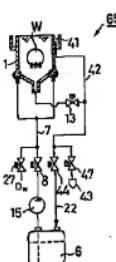
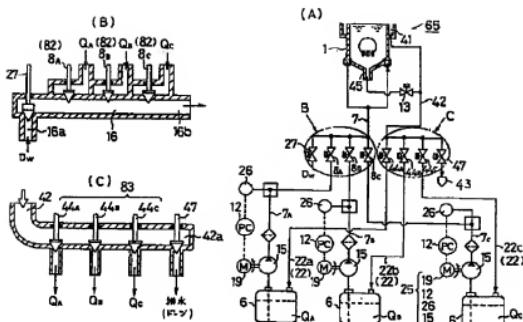


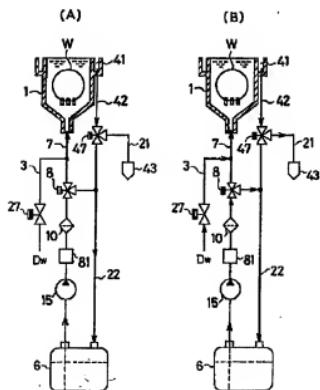
圖 2-1



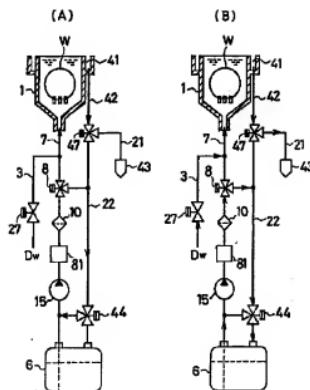
【図 4】



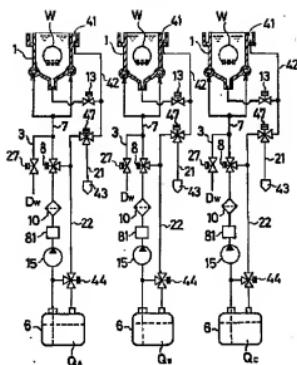
【図 5】



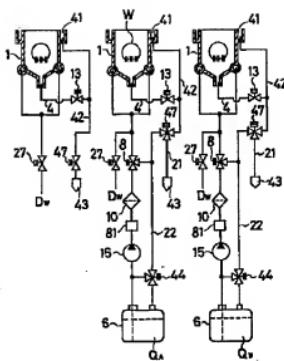
【図 6】



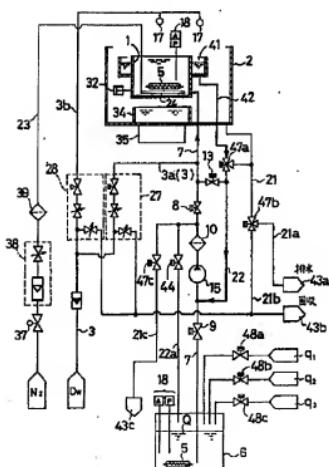
【図 7】



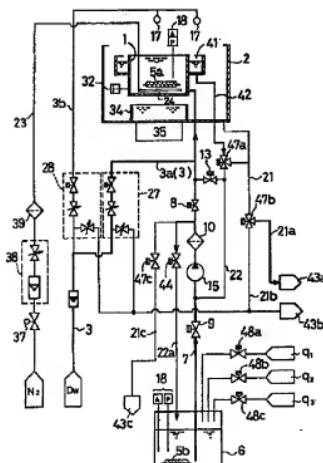
【図 8】



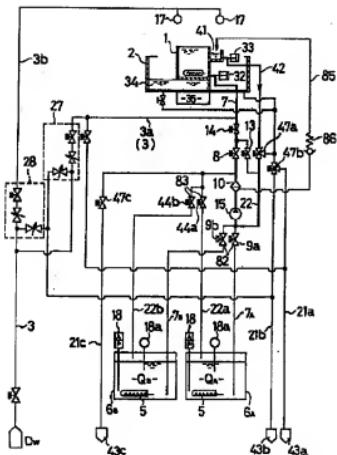
【図 9】



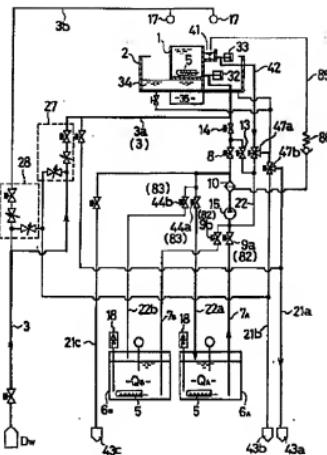
【図 10】



[☒ 1 1]

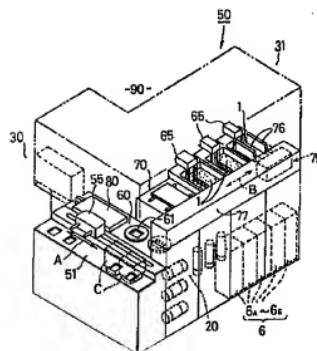
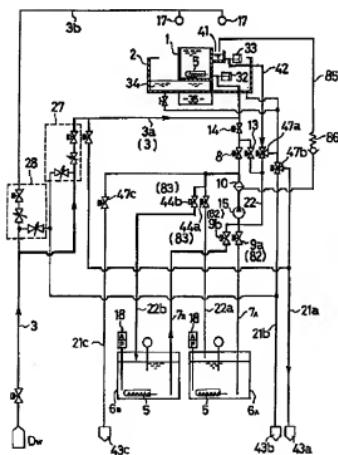


[図12]

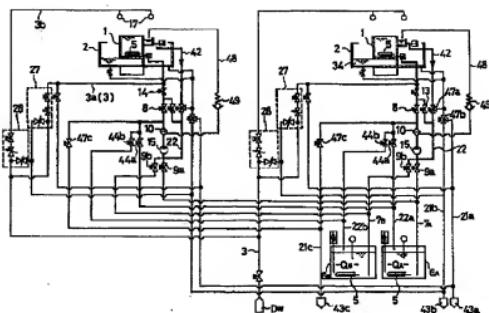


[图 1-3]

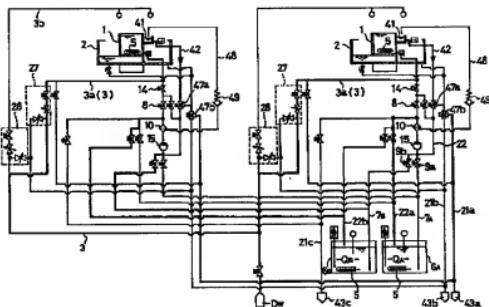
[図16]



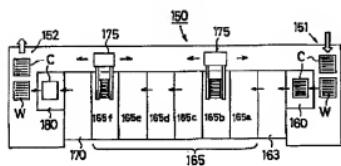
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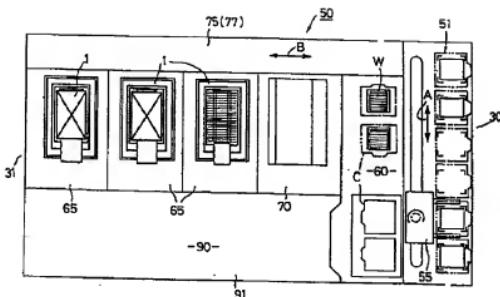
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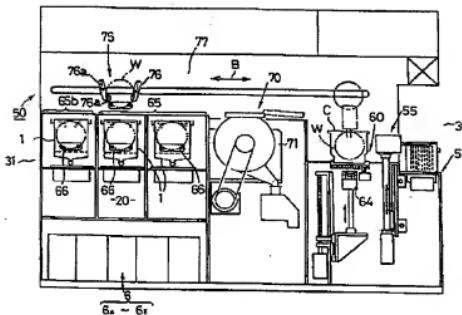
[图 1-9]



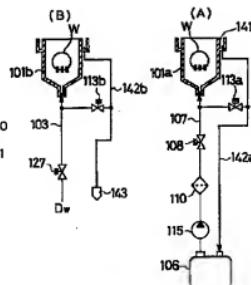
【図17】



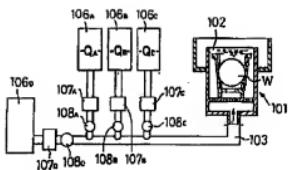
[図18]



【図20】



【图21】



フロントページの書き

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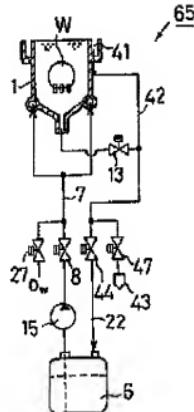
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(54) IMMERSION PROCESSING SYSTEM FOR SUBSTRATE

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce running cost by suppressing consumption of processing liquid in an immersion processing system performing surface treatment of a semiconductor substrate, or the like, while preventing the size of the immersion processing system from increasing.

SOLUTION: A liquid discharge path 42 led out from an overflow type substrate processing bath 1 is branched into a path being coupled with a drain 43 through a liquid discharge valve 47 and a processing liquid collecting path 21 being coupled with a processing liquid storage container 6 through a processing liquid collecting valve 44. Every time when a plurality of kinds of surface treatment are conducted, processing liquid flowing over the substrate processing bath 1 is collected in the storage container 6 through the processing liquid collecting valve 44 and reused. At the time of transfer from chemical processing to pure water processing, pure water is supplied under a state where the processing liquid is placed in the substrate processing bath. The processing liquid is overflowed and replaced by pure water and the substrate is kept away from the air thus preventing formation of oxide film on the surface of the substrate.



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CLAIMS

[Claim(s)]

[Claim 1] While the above-mentioned effluent way is branched and one side is open for free passage to an effluent drain via an effluent valve in a dipping processor of a substrate characterized by comprising the following. Another side is open for free passage to the above-mentioned treating solution storage container via a treating solution recovering valve as a treating solution recovery passage, and in a chemical treatment. Supply a treating solution in a treating solution storage container to a substrate treatment tub, and it is made to overflow from a treating solution supply route, In pure water processing which collects from the above-mentioned effluent way to the treating solution storage container concerned via a treating solution recovering valve, and is performed after the above-mentioned chemical treatment. Supply pure water to a substrate treatment tub, make it overflow from a purified water supply route, discard from the above-mentioned effluent way to an effluent drain via an effluent valve, and shift to pure water processing from the above-mentioned chemical treatment is faced, A dipping processor of a substrate characterized by what a treating solution in the above-mentioned substrate treatment tub is transposed for to pure water by making pure water supply and overflow where it suspended supply of a treating solution, then a treating solution is put into the above-mentioned substrate treatment tub.

An overflowed type substrate treatment tub which immerses a substrate into a treating solution and makes a surface treatment of a substrate.

A treating solution supply route connected with the above-mentioned substrate treatment tub. A treating solution storage container which passed a treating solution introduction valve and a feeding pump to the above-mentioned treating solution supply route in order, and was open for free passage.

A purified water supply route which was open for free passage via a pure water introduction valve to the above-mentioned treating solution supply route, and an effluent way which derives an effluent overflowed from the above-mentioned substrate treatment tub to an effluent drain.

[Claim 2] While the above-mentioned effluent way is branched and one side is open for free passage to an effluent drain via an effluent valve in a dipping processor of a substrate characterized by comprising the following. Another side is open for free passage to the above-mentioned treating solution storage container via a treating solution recovering valve as a treating solution recovery passage, and in HF processing. Supply HF in a treating solution storage container to a substrate treatment tub, and it is made to overflow from a treating solution supply route, In pure water processing which collects from the above-mentioned effluent way to the treating solution storage container concerned via a treating solution recovering valve, and is performed after the above-mentioned HF processing. Supply pure water to a substrate treatment tub, make it overflow from a purified water supply route, discard from the above-mentioned effluent way to an effluent drain via an effluent valve, and shift to pure water processing from the above-mentioned HF processing is faced, A dipping processor of a substrate characterized by what HF in the above-mentioned substrate treatment tub is transposed for to pure water by suspending supply of HF, then making the above-mentioned

substrate treatment tub supply and overflow pure water in the state of HF ON ****.
An overflowed type substrate treatment tub which immerses a substrate into a treating solution and makes a surface treatment of a substrate.
A treating solution supply route connected with the above-mentioned substrate treatment tub.
A treating solution storage container which passed a treating solution introduction valve and a feeding pump to the above-mentioned treating solution supply route in order, and was open for free passage.
A purified water supply route which was open for free passage via a pure water introduction valve to the above-mentioned treating solution supply route, and an effluent way which derives an effluent overflowed from the above-mentioned substrate treatment tub to an effluent drain.

[Claim 3]In a dipping processor of the substrate according to claim 1 or 2, while attaching a filter between a feeding pump of said treating solution supply route, and said treating solution introduction valve, Rather than a treating solution introduction valve, open a purified water supply route for free passage to the downstream, connect between a feeding pump of the above-mentioned treating solution supply route, and a purified water supply route terminal area, and a treating solution recovery passage in pure water processing. A dipping processor of a substrate characterized by what a treating solution recovery passage is circulated and a treating solution pumped up with a feeding pump is refluxed for to the above-mentioned treating solution storage container.

[Translation done.]

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DETAILED DESCRIPTION**[Detailed Description of the Invention]****[0001]**

[Field of the Invention]This invention relates to the dipping processor of the substrate used for carrying out the surface treatment of the laminated substrates (a substrate is only called below), such as a semiconductor wafer and a glass substrate for liquid crystals, in the dipping treatment part of a substrate processing device.

[0002]

[Description of the Prior Art]As a dipping processor of the substrate which there are some which are conventionally shown in drawing 19 as the above-mentioned substrate processing device, and is used in the dipping treatment part 165, The thing (henceforth the conventional example 1) shown in drawing 20 or the thing (henceforth the conventional example 2) which it was indicated by JP,4-42531,A and shown in drawing 21 is known. Drawing 19 is a top view of the whole substrate processing device here.

[0003]The carrying in part 151 of the cassette C by which this substrate processing device 150 accommodated the substrate W as shown in drawing 19, The substrate extraction part 160 which picks out the substrate W from the cassette C, and the substrate transfer robot 175 which does package maintenance and conveys two or more substrates W, The zipper washing section 163 which washes the substrate transfer robot's 175 chuck hand, Two or more dipping treatment parts 165 which immerse and process sequentially two or more substrates W held by the robot 175 concerned, It comprises the dryer part 170 arranged at the backside of the dipping treatment part 165, the substrate containing section 180 which stores the processed substrate W into the cassette C, and the carrying out portion 152 which takes out the cassette C which stored the substrate W.

[0004]And a dipping processor as shown, for example in drawing 20 (A) and (B) is arranged, and it is constituted by the above-mentioned dipping treatment part 165 so that various kinds of surface treatments may be made. Drawing 20 (A) is a dipping processor of the substrate for carrying out the surface treatment (henceforth a chemical treatment) according the substrate W to two or more sorts of treating solutions, and drawing 20 (B) is a dipping processor for carrying out rinsing treatment (henceforth pure water processing) according the substrate W concerned to pure water D_W. These dipping processors are arranged suitably at either of the above-mentioned dipping treatment parts 165 (165a-165f).

[0005]The overflowed type substrate treatment tub 101a which the dipping processor of drawing 20 (A) immerses the substrate W into a treating solution, and carries out a surface treatment, The treating solution supply route 107 connected with the substrate treatment tub 101a, and the treating solution storage container 106 which passed the treating solution introduction valve 108, the filter 110, and the feeding pump 115 to the treating solution supply route 107 in order, and was open for free passage, The recovery passage 142a which collects the treating solutions overflowed from the substrate treatment tub 101a to the treating solution storage container 106, It is constituted so that the treating solution which possessed the feeding-and-discarding change-over valve 113a which opens the treating solution supply route 107 and the recovery passage 142a for free passage so that opening and closing are possible, and was overflowed from

the substrate treatment tub 101a on the occasion of the chemical treatment may be refluxed to the treating solution storage container 6.

[0006]The dipping processor of drawing 20 (B) The overflowed type substrate cleaning tank 101b, The purified water supply route 103 connected with the substrate cleaning tank 101b, and the pure water introduction valve 127 provided in the purified water supply route 103, The drainage ditch 142b which derives the pure water overflowed from the substrate cleaning tank 101b to the wastewater drain 143, It is constituted so that the wastewater which possessed the feeding-and-discarding change-over valve 113b which opens the purified water supply route 103 and the drainage ditch 142b for free passage so that opening and closing are possible, and was overflowed from the substrate cleaning tank 101b on the occasion of pure water processing may be discharged to the drain 143.

[0007]On the other hand, as shown in drawing 21, the conventional example 2 supplies two or more sorts of treating solutions 102 one by one in the single substrate treatment tub 101, and is made to perform the surface treatment of the substrate W. Namely, the overflowed type substrate treatment tub 101 which immerses two or more substrates W into the treating solution 102, and makes the surface treatment of the substrate W, The treating solution supply route 103 which supplies two or more treating solutions 102 of a seed from the lower part of the substrate treatment tub 101, Two or more treating solution storage container 106_A which was open for free passage via treating solution introduction valve 108_A - 108_C and flow-regulator 107_A - 107_C, respectively to the treating solution supply route 103 - 106_C, It has pure water supply source 106_D which was open for free passage via pure water introduction valve 108_D and flow-regulator 107_D, It is constituted so that opening and closing control of each introduction valve 108_A - the 108_D may be carried out selectively and predetermined treating solution Q_A - Q_C may be supplied to the substrate treatment tub 101.

[0008]Chloride Q_B, etching agent Q_C like [106_C] hydrogen fluoride, etc. are stored by treating solution storage container 106_A at hydrogen peroxide Q_A and 106_B among the above-mentioned treating solution storage container 106_A - 106_C. And the substrate treatment tub 101 is constituted for two or more of these sorts of every surface treatments as an overflowed type processing tub in which the substitution of the treating solution 102 is possible, and the overflowing treating solution is discharged to a drain (graphic display abbreviation).

[0009]

[Problem(s) to be Solved by the Invention]Since the dipping processor of drawing 20 (A) and (B) is arranged at each dipping treatment parts [165a-165f] each, the above-mentioned substrate processing device 150 has the difficulty that the whole device is enlarged. Since the conventional example 2 discards to a drain the treating solution by two or more treating solutions overflowed from the substrate treatment tub 101 for every chemical treatment, the amount of consumption of a treating solution increases and the running cost of the whole substrate processing device becomes expensive. This invention makes it a technical technical problem to have been made in view of such a situation, to prevent and combine that a substrate processing device is enlarged, and to aim at reduction of a running cost.

[0010]

[Means for Solving the Problem]The invention according to claim 1 is provided with the following composition in order to solve said technical problem. Namely, an overflowed type substrate treatment tub which immerses a substrate into a treating solution and makes a surface treatment of a substrate, A treating solution supply route connected with the above-mentioned substrate treatment tub, and a treating solution storage container which passed a treating solution introduction valve and a feeding pump to the above-mentioned treating solution supply route in order, and was open for free passage, In a dipping processor of a substrate possessing a purified water supply route which was open for free passage via a pure water introduction valve to the above-mentioned treating solution supply route, and an effluent way which derives an effluent overflowed from the above-mentioned substrate treatment tub to an effluent drain,

While it branches and one side is open for free passage to an effluent drain via an effluent valve, another side is open for free passage to the above-mentioned treating solution storage container via a treating solution recovering valve as a treating solution recovery passage, and the above-mentioned effluent way in a chemical treatment. Supply a treating solution in a treating solution storage container to a substrate treatment tub, and it is made to overflow from a treating solution supply route, In pure water processing which collects from the above-mentioned effluent way to the treating solution storage container concerned via a treating solution recovering valve, and is performed after the above-mentioned chemical treatment. Supply pure water to a substrate treatment tub, make it overflow from a purified water supply route, discard from the above-mentioned effluent way to an effluent drain via an effluent valve, and shift to pure water processing from the above-mentioned chemical treatment is faced. By making pure water supply and overflow, where it suspended supply of a treating solution, then a treating solution is put into the above-mentioned substrate treatment tub, A treating solution in the above-mentioned substrate treatment tub is transposed to pure water.

[0011]An overflowed type substrate treatment tub which the invention according to claim 2 immerses a substrate into a treating solution, and makes a surface treatment of a substrate, A treating solution supply route connected with the above-mentioned substrate treatment tub, and a treating solution storage container which passed a treating solution introduction valve and a feeding pump to the above-mentioned treating solution supply route in order, and was open for free passage, In a dipping processor of a substrate possessing a purified water supply route which was open for free passage via a pure water introduction valve to the above-mentioned treating solution supply route, and an effluent way which derives an effluent overflowed from the above-mentioned substrate treatment tub to an effluent drain, While it branches and one side is open for free passage to an effluent drain via an effluent valve, another side is open for free passage to the above-mentioned treating solution storage container via a treating solution recovering valve as a treating solution recovery passage, and the above-mentioned effluent way in HF processing. Supply HF in a treating solution storage container to a substrate treatment tub, and it is made to overflow from a treating solution supply route, In pure water processing which collects from the above-mentioned effluent way to the treating solution storage container concerned via a treating solution recovering valve, and is performed after the above-mentioned HF processing. Supply pure water to a substrate treatment tub, make it overflow from a purified water supply route, discard from the above-mentioned effluent way to an effluent drain via an effluent valve, and shift to pure water processing from the above-mentioned HF processing is faced, By suspending supply of HF, then making the above-mentioned substrate treatment tub supply and overflow pure water in the state of HF ON ****, HF in the above-mentioned substrate treatment tub is transposed to pure water.

[0012]And in a dipping processor of the substrate according to claim 1 or 2, while an invention of claim 3 attaches a filter between a feeding pump of said treating solution supply route, and said treating solution introduction valve, Rather than a treating solution introduction valve, open a purified water supply route for free passage to the downstream, connect between a feeding pump of the above-mentioned treating solution supply route, and a purified water supply route terminal area, and a treating solution recovery passage in pure water processing. A treating solution pumped up with a feeding pump is circulated to a treating solution recovery passage, and the above-mentioned treating solution storage container is refluxed.

[0013]

[Function]In the invention of claim 1, since the purified water supply route was opened for free passage via the pure water introduction valve to the treating solution supply route to the substrate treatment tub, sequential execution of a chemical treatment and the pure water processing will be carried out by one substrate treatment tub. While it branches and one side is open for free passage to an effluent drain via an effluent valve, another side is open for free passage to the above-mentioned treating solution storage container via a treating solution recovering valve as a treating solution recovery passage, and the above-mentioned effluent way in a chemical treatment. From a treating solution supply route, the treating solution in a treating solution storage container is supplied to a substrate treatment tub, and overflows, and it is

collected from the above-mentioned effluent way by the treating solution storage container concerned via a treating solution recovering valve, and flows back to a substrate treatment tub again. That is, a treating solution is reused, without being discarded. On the other hand, in the pure water processing performed after the above-mentioned chemical treatment, from a purified water supply route, pure water is supplied to a substrate treatment tub, is overflowed, and is discarded by the effluent drain via an effluent valve from the above-mentioned effluent way. And on the occasion of the shift to the pure water processing from the above-mentioned chemical treatment, supply of a treating solution is suspended and the treating solution in the above-mentioned substrate treatment tub is transposed to pure water by supplying pure water and overflowing successively, where a treating solution is put into the above-mentioned substrate treatment tub. That is, within a substrate treatment tub, a substrate shifts to pure water processing from a chemical treatment, without touching air.

[0014]Also in the invention of claim 2, since the purified water supply route was opened for free passage via the pure water introduction valve to the treating solution supply route to the substrate treatment tub, sequential execution of a chemical treatment and the pure water processing is carried out by one substrate treatment tub. While it branches and one side is open for free passage to an effluent drain via an effluent valve, another side is open for free passage to the above-mentioned treating solution storage container via a treating solution recovering valve as a treating solution recovery passage, and the above-mentioned effluent way in HF processing. From a treating solution supply route, HF in a treating solution storage container is supplied to a substrate treatment tub, and overflows, it is collected from the above-mentioned effluent way by the treating solution storage container concerned via a treating solution recovering valve, and HF is reused, without being discarded. On the other hand, in the pure water processing performed after the above-mentioned HF processing, from a purified water supply route, pure water is supplied to a substrate treatment tub, and overflows, and it is discarded by the effluent drain via an effluent valve from the above-mentioned effluent way. And on the occasion of the shift to the pure water processing from the above-mentioned HF processing, supply of HF is suspended, and successively, when pure water carries out supply ***** overflow in the state of HF ON ***** at the above-mentioned substrate treatment tub, HF in the above-mentioned substrate treatment tub is transposed to pure water. That is, within a substrate treatment tub, a substrate shifts to pure water processing from HF processing, without touching air.

[0015]In the invention of claim 3, in the dipping processor of the substrate according to claim 1 or 2, while attaching a filter between the feeding pump of said treating solution supply route, and said treating solution introduction valve, A chemical treatment since the purified water supply route was opened for free passage to the downstream and the treating solution recovery passage was connected rather than the treating solution introduction valve between the feeding pump of the above-mentioned treating solution supply route, and the purified water supply route terminal area (HF processing is included.) While pure water processing is performed like the following, it is a treating solution (HF is included). the following — being the same — it refreshes by filtering (only henceforth "filtering"). When pure water processing is performed, the treating solution pumped up with the feeding pump flows down a treating solution recovery passage, after being filtered, and flows back to a treating solution storage container again.

[0016]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is described based on a drawing. The substrate processing device for substrate washing with which this invention is applied first is explained. As for the outline perspective view of a substrate processing device, and drawing 17, the outline top view of the device and drawing 18 of drawing 16 are outline drawings of longitudinal section of the device. While this substrate processing device 50 installs two or more substrate treatment tubs 1 side by side in the dipping treatment part 65 mentioned later and performs washing processing of a semiconductor wafer (only henceforth a wafer), The penetrant removers (only henceforth a treating solution) overflowed from the substrate treatment tub 1 are collected to the treating solution storage container 6, and the recycling of them is enabled.

[0017]As shown in drawing 16 – drawing 18, this substrate processing device 50, The carrying in/out part 51 of the substrate accommodation cassette C, and the substrate transfer part 60 which loads the wafer W with the wafer W into extraction or the cassette C from the cassette C, The cassette transfer robot 55 which transfers the cassette C between the carrying in/out part 51 of the cassette C, and the substrate transfer part 60, It comprises the dipping treatment part 65 which washes two or more wafers W collectively, the liquid end board dryer part 70 of the wafer W, and the substrate transfer robot 75 which does package maintenance and conveys two or more wafers W picked out from the cassette C in the substrate transfer part 60 to the above-mentioned dipping treatment part 65 and the substrate dryer part 70.

[0018]As shown in drawing 16 – drawing 18, rise and fall and rotation are free for the above-mentioned cassette transfer robot 55, It is constituted so that the cassette C which was constituted movable in the direction of arrow A, and transferred the cassette C carried in to the carrying in/out part 51 on the table 61 of the substrate transfer part 60, and accommodated the washed wafer W may be transferred to the carrying in/out part 51 from the table 61 concerned. As the above-mentioned substrate transfer robot 75 shows drawing 16 – drawing 18, It is provided in the direction of arrow B movable, and two or more wafers W received from the lifter 64 of the above-mentioned substrate transfer part 60 are held by the substrate transfer robot's 75 substrate pinch arm 76, and it is constituted so that it may convey one by one into the dipping treatment part 65 and the substrate dryer part 70 along with the moving section 77.

[0019]Various kinds of dipping processors concerning this invention are allocated in the above-mentioned dipping treatment part 65 so that it may state below. However, in drawing 16 – drawing 18, what installed the three substrate treatment tubs 1 side by side is illustrated. Namely, in two or more wafers W received from said substrate transfer robot 75, in each substrate treatment tub 1, one by one, the above-mentioned dipping treatment part 65 is constituted by the board holder 66 which installed the three overflowed type substrate treatment tubs 1 side by side, and was formed in each substrate treatment tub 1 so that rise and fall were possible so that immersion is possible. The concrete contents of the dipping processor concerning the embodiment of this invention are mentioned later.

[0020]The above-mentioned substrate dryer part 70 possesses the drying process tub 71 which carries out liquid end desiccation by rotary centrifugal force by making the neighborhood of a center of the principal plane of the wafer W into a center of rotation, as indicated to JP,1-255227,A which starts these people's proposal, for example. This substrate dryer part 70 is changed to the thing of the centrifugal type concerned, and even if it promotes desiccation with heating steam or the dry method by decompression in addition to the dry method which uses an organic solvent etc., or this, it does not interfere.

[0021]As a layout of the above-mentioned substrate processing device 50, as shown in drawing 16 – drawing 18, the carrying in/out part 51, the substrate transfer part 60, the substrate dryer part 70, and the dipping treatment part 65 of said cassette C are arranged in order toward the back facing the work area 31 for preservation from the front facing the clean room work area 30. As shown in drawing 16 and drawing 18, the piping chamber 20 for feeding and discarding of a treating solution is arranged in the lower part of the three substrate treatment tubs 1 of the above-mentioned dipping treatment part 65, and the treating solution storage container 6 for washing is arranged at three steps of upper and lower sides in the lower part of this piping chamber 20 for feeding and discarding. As shown in drawing 16 and drawing 17, the substrate transfer robot's 75 moving section 77 is formed in the right-hand side of above-mentioned substrate transfer part 60, substrate dryer-part 70, and dipping treatment part 65 at a cross direction, and back space is formed as the maintenance space 90 rather than said substrate transfer part 60 in the space of such left-hand side. Two or more piping, a valve, etc. are constructed by the floor of the maintenance space 90.

[0022]That is, in the above-mentioned substrate processing device 50, since the substrate treatment tub 1, the piping chamber 20 for feeding and discarding, and the treating solution storage container 6 of the dipping treatment part 65 are accumulated on three steps of upper and lower sides and it arranges to a lengthwise direction, the maintenance space 90 is securable for these area that was accumulated and faced the left-hand side of the part. If it puts in

another way, as shown in drawing 17, the excessive space in the substrate processing device 50 can be set up as the maintenance space 90 by packing the various work block of the dipping treatment part 65, the substrate transfer part 60, etc. in the shape of an L character by plane view. In summarizing the substrate processing device 50 whole compactly, and being able to attain space-saving-ization of the whole clean room efficiently by mainly accumulating the dipping treatment part 65 on longitude. The effective use rate of the space in a clean room is further raised, so that the installed number of the substrate processing device 50 concerned increases.

[0023]In the layout of the substrate treatment tub 1 of the above-mentioned dipping treatment part 65, and the substrate dryer part 70. As shown in drawing 16 – drawing 18, three overflowed type the substrate treatment tubs 1, and the drying treatment parts 70 and said substrate transfer parts 60 are arranged in order toward the front side which attends the clean room work area 30 from the back side facing the work area 31 for preservation. That is, since the above-mentioned substrate dryer part 70 is arranged between the dipping treatment part 65 and the substrate transfer part 60, it dries the wafer W by which washing processing was carried out as quickly as possible, is returned to the cassette C, and can be efficiently taken out from the carrying in/out part 51. On the other hand, since this substrate drying process does not receive strongly the temporal restriction to return to the cassette C but standby time can be taken between the return in the substrate transfer part 60 from completion of a drying process, the drying treatment part 70 can be made to bear the role like a buffer to the adjoining substrate transfer part 60 in respect of a process of operation.

[0024]Since the acid which carried out temperature up in acid cleaning processing is usually used, are easy to generate the steam and mist of acid, but. For example, when carrying out this acid cleaning processing by the substrate treatment tub 1 by the side of the most distant back from the clean room work area 30, the adverse effect to the clean room work area 30 is prevented, and the safety of work can be secured. Hereafter, the embodiment of the various dipping processors allocated in the above-mentioned dipping treatment part 65 is described one by one.

[0025]Drawing 1 is an outline distribution diagram of the dipping processor concerning Embodiment 1 of this invention. The three substrate treatment tubs 1, 1, and 1 which immerse two or more substrates W collectively into a treating solution, and make the surface washing of the substrate W as this dipping processor is shown in drawing 1. The treating solution storage container 6 which passed the treating solution introduction valve 8 and the feeding pump 15 to the treating solution supply route 7 which supplies a treating solution, and the treating solution supply route 7 in order, and was open for free passage from the lower part of each substrate treatment tub 1. The purified water supply route 3 which was open for free passage via the pure water introduction valve 27 to the treating solution supply route 7, and the effluent way 42 which derives the effluent overflowed from the substrate treatment tub 1 to the effluent drain 43 are provided. That is, in each substrate treatment tub 1, the chemical treatment later mentioned by predetermined treating solution Q_A – Q_C , respectively is performed independently.

[0026]The above-mentioned substrate treatment tub 1 is formed in side-view substantially v-shaped and plain-view substantially rectangle-shaped one by the product made from silica glass, as shown in drawing 1. While connecting the treating solution supply route 7 with the lower part, forming the uniform upflow of a treating solution in the substrate treatment tub 1 and carrying out the surface treatment of the substrate W, it is constituted as an overflow tub which can replace a treating solution promptly for two or more sorts of every washing processings. Not only the product made from silica glass but when, using for a penetrant remover HF etc. which make silica glass corrode for example, what was formed at charges of resin lumber, such as tetrafluoroethylene resin which has corrosion resistance, may be sufficient as the substrate treatment tub 1 concerned. It does not interfere, even if it installs the four or more overflowed type substrate treatment tubs 1 in the dipping treatment part 65 side by side.

[0027]The treating solution supply route 7 connected with the lower part of each substrate treatment tub 1 in the shape of parallel as the composition for supplying a treating solution was

shown in drawing 1. The treating solution storage container 6 connected with the treating solution supply route 7 via the treating solution introduction valve 8 and the feeding pump 15, and the purified water supply route 3 and pure water supply source (graphic display abbreviation) which were open for free passage via the pure water introduction valve 27 to the above-mentioned treating solution supply route 7 are provided. Although the above-mentioned purified water supply route 3 turns into a main aisle of the pure water which is ordinary temperature or supplies pure water D_W heated to prescribed temperature, when pure water D_W prevents scaling of a substrate, it is preferred to use what performed deoxidation treatment.

[0028]If the above-mentioned treating solution introduction valve 8 is opened, the treating solution in the treating solution storage container 6 will be fed by the substrate treatment tub 1 with the feeding pump 15, and will be overflowed from the substrate treatment tub 1, and a chemical treatment will be performed. If the above-mentioned pure water introduction valve 27 is opened, from the purified water supply route 3, pure water D_W will be supplied to the substrate treatment tub 1, will overflow, and pure water processing will be performed. Namely, selectively, the treating solution supply route 7 constitutes treating solution $Q_A - Q_C$, and pure water D_W from switching operation of the treating solution introduction valve 8 and the pure water introduction valve 27 so that supply is possible. Automatically, treating solution $Q_A - Q_C$ are constituted by the above-mentioned treating solution storage container 6 so that a supplement is possible.

[0029]The composition for discharging treating solution $Q_A - Q_C$. As shown in drawing 1, the overflow liquid stripping section 41 attached to the upper section of each substrate treatment tub 1, the effluent way 42 which discharges the overflowing treating solution, and the communicating path 4 drawn from the pars basilaris ossis occipitalis of the substrate treatment tub 1 via the feeding-and-discarding change-over valve 13 on the effluent way 42 concerned are provided. the circulation lower part side of the above-mentioned effluent way 42 — two forks — it branches to ***, one of these is connected to the effluent drain 43 via the effluent valve 47, and it connects with said treating solution storage container 6 via the treating solution recovering valve 44 by making the another side into the treating solution recovery passage 22. The above-mentioned feeding-and-discarding change-over valve 13 is for deriving each treating solution Q_A in the substrate treatment tub 1 — Q_C to the effluent way 42 if needed.

[0030]According to this Embodiment 1, as shown in drawing 1, the treating solution supply route 7 drawn from each treating solution storage container 6 is connected to the lower part of each substrate treatment tub 1 via the treating solution introduction valve 8.

Predetermined treating solution $Q_A - Q_C$ are supplied to each substrate treatment tub 1 from each treating solution storage container 6, respectively.

The purified water supply route 3 is connected to the lower part of each substrate treatment tub 1 via the pure water introduction valve 27, and supply of pure water D_W is attained respectively at each substrate treatment tub 1. And the downstream of the effluent way 42 drawn from the upper part of the substrate treatment tub 1 has branched to the 2-way by the side of the effluent drain 43 opened for free passage via the effluent valve 47 the treating solution storage container 6 side opened for free passage via the treating solution recovering valve 44. For this reason, when treating solution Q_A of drawing 1 is described, treating solution Q_A in the treating solution storage container 6, After overflowing from the treating solution supply route 7 to each substrate treatment tub 1 and washing the wafer W, it is collected from the effluent way 42 by the treating solution storage container 6 via the treating solution recovering valve 44, and is recycled by the substrate treatment tub 1.

[0031]On the other hand, in the pure water processing performed after a chemical treatment, from the purified water supply route 3, pure water D_W is supplied to the substrate treatment tub 1, is overflowed, and is discarded by the effluent drain 43 via the effluent valve 47 from the effluent way 42. It is similarly constituted from the substrate treatment tub 1 by treating solution

Q_B and Q_C callable. Therefore, since each treating solution Q_A overflowed from the substrate treatment tub 1 – Q_C are collected and reused by the treating solution storage container 6 via the treating solution recovering valve 44. Compared with the conventional example 2 which discards a treating solution for two or more sorts of every chemical treatments, the amount of consumption of a treating solution is controlled effectively, and the running cost of the whole substrate processing device can be reduced.

[0032]In this dipping processor, since the wafer W is immersed in the three substrate treatment tubs 1 installed side by side one by one and parallel processing is carried out by two or more sorts of treating solution Q_A – Q_C as shown in drawing 1, a throughput improves. And since a treating solution is made to overflow from the upper part of the substrate treatment tub 1 in this dipping processor, when shifting to pure water processing from a chemical treatment. It is possible not to all discharge the penetrant remover in the substrate treatment tub 1, but for ** to also replace a drug solution by pure water, and the wafer W cannot touch air until a chemical treatment and pure water processing are completed. For this reason, there is no possibility that an oxide film may be formed in a wafer surface, or the impurity in the air may adhere. The penetrant remover in the substrate treatment tub 1 all is not discharged, but ** can also perform charge and extraction of the wafer W.

[0033]Next, an example is given and explained about the contents of the chemical treatment in the above-mentioned Embodiment 1. SC_1 processing is performed in the 1st substrate treatment tub 1. As treating solution Q_A , the mixed liquor of ammonia ($NH_4 OH$), the hydrogen peroxide solution (H_2O_2), and pure water D_W which were prepared is used. Pure water processing is carried out after the chemical treatment by treating solution Q_A , and organic matters, such as photoresist adhering to the surface of the wafer W, are removed. It may replace with SC_1 processing and CARO processing may be performed. Sulfuric peroxide mixture is used as treating solution Q_A in this case.

[0034] SC_2 processing is performed in the 2nd substrate treatment tub 1. As treating solution Q_B , the mixed liquor of the chloride (HCl), hydrogen peroxide solution (H_2O_2), and pure water which were prepared is used. Pure water processing is similarly carried out after the chemical treatment by treating solution Q_B , and the metal ion adhering to the surface of the wafer W is removed. HF processing is performed in the 3rd substrate treatment tub 1. The 50% solution of hydrogen fluoride is used as treating solution Q_C , and the unexposed portion of the surface of the wafer W, etc. are etched. It may replace with the above-mentioned hydrogen fluoride, and a phosphoric acid filtered water may be used.

[0035]According to the manufacturing process, a surface treatment including washing processing of a wafer is not necessarily immersed in the 1st – the 3rd substrate treatment tub 1 one by one rather than is uniform. Incidentally, various surface treatments like for example, following the (1) – (4) as the type are possible.

(1) SC_1 processing \rightarrow HF processing \rightarrow SC_2 processing (2) HF processing \rightarrow SC_1 processing \rightarrow SC_2 processing (3) SC_1 processing \rightarrow — SC_2 processing (4) — in addition to this — HF processing or SC_1 processing.

In the embodiment mentioned later, the type of the above-mentioned chemical treatment is applicable similarly.

The overlapping explanation is omitted.

[0036]If the wafer W is contacted to air after carrying out HF processing when HF processing is included in one of chemical treatments, HF, and O_2 and Si will react, an impure compound will arise on the surface of the wafer W, and it will become particle. For this reason, after supplying HF to the substrate treatment tub 1 and circulating through it, HF is transposed to pure water

by making pure water supply and overflow, where it suspended supply of HF, then HF is put into the substrate treatment tub 1. Thereby, the wafer W always remains in liquid, and it is removed, without an HF component generating particle by the continuous supply of pure water.

[0037]The resistivity of pure water is detected, or last rinsing treatment by the above-mentioned pure water is consisted of by progress of fixed time so that pure water processing may be completed. In pulling up the wafer W from the substrate treatment tub 1 after the last rinse is completed, in order to prevent the particle which floated from adhering to the wafer W, it carries out making pure water overflow.

[0038]The point that the number of the substrate treatment tub 1 is reduced and enlargement of a substrate processing device can be prevented by carrying out a chemical treatment and pure water processing as an advantage in the above-mentioned Embodiment 1 using the single substrate treatment tub 1. The point that a running cost can be reduced by collecting and reusing each treating solution $Q_A - Q_C$ to the treating solution storage container 6. Although the point that an oxide film can be prevented from being formed in a wafer surface by replacing a treating solution by pure water without all discharging the treating solution in the substrate treatment tub 1, when shifting to pure water processing from a chemical treatment is mentioned. Also in Embodiment 2 mentioned later - Embodiment 11, these advantages are the same, and the overlapping explanation is omitted.

[0039]Drawing 2 is an outline distribution diagram of the dipping processor concerning Embodiment 2 of this invention. This dipping processor sets one of the three substrate treatment tubs 1 allocated in said dipping treatment part 65 as the substrate treatment tub only for pure water processing, as shown in drawing 2. Namely, while drawing the purified water supply route 3 from the lower part of the tub 1 only for rinse and connecting a pure water supply source (not shown) to the purified water supply route 3 via the pure water introduction valve 27, While draw the effluent way 42 from the upper part of the tub 1 only for rinse, and the effluent drain 43 is connected to the effluent way 42 via the effluent valve 47, and pure water D_W is supplied to the tub 1 only for rinse, overflows and carrying out pure water processing of the wafer W. It is constituted so that it may be discarded by the effluent drain 43 via the effluent valve 47 from the effluent way 42.

[0040]In this Embodiment 2, after the chemical treatment by treating solution Q_A or Q_B is performed by each of the two substrate cleaning tanks 1, pure water processing is performed lightly succeeding, but pure water processing by pure water D_W is performed by the above-mentioned tub 1 only for rinse still more nearly separately. For this reason, compared with the case where a chemical treatment and pure water processing are performed by each substrate treatment tub 1 like Embodiment 1, the wafer W can be rinsed powerfully, the time required of pure water processing is shortened, and a throughput improves.

[0041]Drawing 3 is an outline distribution diagram of the dipping processor concerning Embodiment 3 of this invention. This dipping processor is what allocated the substrate treatment tub 1 of the single tub in the dipping treatment part 65 of the substrate cleaning device 50. While collecting the treating solutions which the substrate treatment tub 1 is supplied and are overflowed like said Embodiment 1 or Embodiment 2 to the treating solution storage container 6 via the treating solution recovery passage 22 and the treating solution recovering valve 44 and constituting them so that reuse is possible, It constitutes so that pure water D_W overflowed from the substrate treatment tub 1 may be discarded to the effluent drain 43. Also in this Embodiment 3, while controlling the amount of consumption of a treating solution, the substrate processing device 50 whole can be compactly summarized by single tub-ization of the substrate treatment tub 1.

[0042]Drawing 4 is an outline distribution diagram of the dipping processor concerning Embodiment 4 of this invention. This Embodiment 4 connects two or more treating solution storage containers 6 so that a change is possible. Although the point whose reuse this dipping processor made the treating solution storage container 6 circulate through a treating solution from the substrate treatment tub 1, and was enabled is the same as that of said Embodiments

1-3, As this Embodiment 4 performs three kinds of chemical treatments in order within the one substrate treatment tub 1 to said Embodiment 1 performing three kinds of chemical treatments independently by the three substrate treatment tubs 1, the feature is that it carried out common use of the substrate treatment tub 1 to two or more sorts of chemical treatments.

[0043]That is, as shown in drawing 4 (A), the treating solution supply route 7 is connected with the lower part of the one substrate treatment tub 1 via each treating solution introduction valve 8_A, 8_B and 8_C from each treating solution storage container 6 of three kinds of treating solution Q_A, Q_B and Q_C. Here, above-mentioned treating solution introduction valve 8_A, 8_B and 8_C are also the treating solution selective valves 82. Drawing 4 (B) shows the introduction valve connection way 16 where **, treating solution introduction valve 8_A, 8_B and 8_C which carry out **, and the pure water introduction valves 27 gathered each treating solution in the supply side of this treating solution. The purified water supply route 3 is connected to the one end 16a of the connection way 16 concerned, and the treating solution supply route 7 is connected to the other end 16b.

[0044]Branch the downstream of the effluent way 42 of the above-mentioned substrate treatment tub 1 to four, respectively, and these one side is connected to the effluent drain 43, Another side is connected to the treating solution storage container 6 of the three above-mentioned kinds of treating solution Q_A, Q_B, and Q_C as the treating solution recovery passage 22 (specifically 22a, 22b, 22c). While collecting various kinds of overflowing treating solutions to the treating solution storage container 6, it constitutes so that it can discard to the effluent drain 43 if needed. Drawing 4 (C) shows the important section of the effluent way 42 where **, treating solution recovering valve 44_A, 44_B and 44_C which carry out **, and the effluent valves 47 gathered each treating solution to the discharge side of this treating solution, and the above-mentioned effluent valve 47 for pure water is formed in the innermost part 42a of the downstream of the effluent way 42. Here, above-mentioned treating solution recovering valve 44_A, 44_B, and 44_C are also treating solution ***** 83.

[0045]On the other hand, the feeding means 25 of each treating solution Q_A to the above-mentioned substrate treatment tub 1 – Q_C. The one feeding pump 15 formed in the treating solution supply route 7 (specifically 7_A – 7_C) drawn from each treating solution storage container 6 (specifically 6_A – 6_C) as shown in drawing 4 (A). It comprises the motor 19 which drives the feeding pump 15, the pressure sensor 26 (specifically pressure gauge) formed in the discharge side of the feeding pump 15, and the control means 12 which carries out increase and decrease of the number of rotations of the feeding pump 15 of control based on the detecting signal from the pressure sensor 26. In the feeding means 25 concerned, the pressure sensor 26 detects the excess and deficiency to setting pressure, the control means 12 concerned carries out drive controlling of the drive motor 19 of the feeding pump 15, and a treating solution is fed by the substrate treatment tub 1 with a predetermined setting pressure.

[0046]In washing the wafer W, it carries out the chemical treatment of the wafer W, making the substrate treatment tub 1 circulate through treating solution Q_A via treating solution introduction valve 8_A, and making it overflow first. Treating solution Q_A is successively collected to the treating solution storage container 6 via treating solution recovering valve 44_A of the feeding-and-discarding liquid change-over valve 13 and the effluent way 42 after that. And pure water D_W is supplied to the substrate treatment tub 1 which became empty via the pure water introduction valve 27, and it shifts to pure water processing. Pure water is discharged after rinsing the wafer W, making pure water overflow. After making it circulate like the case of treating solution Q_A and carrying out a chemical treatment also with treating solution Q_B and Q_C, the wafer W is pulled up from the substrate treatment tub 1.

[0047]In the above-mentioned pure water processing, the pure water effluent overflowed from

the substrate treatment tub 1 is discarded to the effluent drain 43 via the effluent valve 47. Since pure water waste fluid is discharged from the innermost part 42a of the effluent way 42 in that case, the treating solution which remains to the wall of the effluent way 42 is flushed effectively. The outlet 45 and the feeding-and-discarding liquid change-over valve 13 of a pars basilaris ossis occipitalis of the substrate treatment tub 1 are constituted so that a quick drain is possible, and they are raising the throughput by rapid discharge. When HF processing is included in one of chemical treatments, In pulling up the substrate W from the substrate treatment tub 1 after the last rinse is completed while replacing HF by pure water by making the substrate treatment tub 1 supply and overflow pure water as mentioned above where HF is put in, it carries out making pure water overflow.

[0048] Drawing 5 shows the outline distribution diagram of the dipping processor concerning Embodiment 5 of this invention, the thick line in the figure (A) shows the treating solution course in the case of a chemical treatment, and the thick line in the figure (B) shows the pure water path and treating solution course of a case of pure water processing. This dipping processor is for performing circulation filtering and the temperature control of a treating solution, while allocating the single substrate treatment tub 1 in said dipping treatment part 65, and a chemical treatment and pure water processing are performed. That is, as shown in drawing 5 (A) and (B), the treating solution introduction valve 8 of the treating solution supply route 7 and the effluent valve 47 of the effluent way 42 consist of respectively switchable cross valves.

[0049] The circulation lower part side of the above-mentioned effluent way 42 -- two forks -- it branches to **, one pipeline 21 is connected to the effluent drain 43, and it connects with the treating solution storage container 6 by making another side into the treating solution recovery passage 22. And while opening the purified water supply route 3 for free passage to the downstream rather than the treating solution introduction valve 8, The filter 10 and the heater (henceforth "an in-line heater") 81 of an inline type are attached between the feeding pump 15 and the treating solution introduction valve 8, and the treating solution supply route 7 and the treating solution recovery passage 22 are connected via the switchable treating solution introduction valve 8.

[0050] When a chemical treatment is performed, as shown in drawing 5 (A), the penetrant remover overflowed from the substrate treatment tub 1 to the overflow liquid stripping section 41, It is collected by the treating solution storage container 6 through the treating solution recovery passage 22, and is again sucked up with the feeding pump 15, and after being filtered with the filter 10 and refreshing, it flows back to the substrate treatment tub 1. When pure water processing is performed, as shown in drawing 5 (B), overflowing pure water is discharged by the effluent drain 43 via the switchable effluent valve 47 and the effluent way 21.

[0051] After filtering the treating solution pumped up with the feeding pump 15 during this pure water processing with the filter 10 and refreshing it, it flows into the treating solution recovery passage 22 via the switchable treating solution introduction valve 8, and flows back to the treating solution storage container 6 again. Even when using the single substrate treatment tub 1 by the above-mentioned composition, while a chemical treatment and pure water processing are performed, circulation filtering of a treating solution is performed, and a treating solution can be made to refresh. Said in-line heater 81 possesses the composition which allocated the heater in the periphery of a pipeline, for example, and heats the treating solution which passes a pipeline. For this reason, when the treating solution through which it circulates during the pure water processing mentioned above can be adjusted to a uniform temperature and it performs especially an elevated-temperature chemical treatment, it becomes possible to supply the treating solution of prescribed temperature in a substrate treatment tub, and to shift to washing processing promptly.

[0052] Drawing 6 shows the outline distribution diagram of the dipping processor concerning Embodiment 6 of this invention, the thick line in the figure (A) shows the treating solution circulating route in the case of a chemical treatment, and the thick line in the figure (B) shows the pure water path and treating solution circulating route of a case of pure water processing. Circulation filtering and the temperature control of a treating solution are performed like [this dipping processor] Embodiment 5 (drawing 5). That is, in the dipping processor of Embodiment 5

(drawing 5), as shown in drawing 6 (A) and (B), while attaching the switchable treating solution recovering valve 44 to the above-mentioned treating solution recovery passage 22, the feeding pump upstream and the treating solution recovery passage 22 of the treating solution supply route 7 are connected via the above-mentioned treating solution recovering valve 44.

[0053]When a chemical treatment is performed, as shown in drawing 6 (A), from the overflow liquid stripping section 41 of the substrate treatment tub 1. A treating solution flows down the treating solution recovery passage 22 via the effluent valve 47, flows into the treating solution supply route 7 via the above-mentioned treating solution recovering valve 44 without the treating solution storage container 6, and while being filtered with the filter 10 and refreshing, after a temperature control is carried out, it flows back to the substrate treatment tub 1 again. On the other hand, when pure water processing is performed, as shown in drawing 6 (B), while refreshing the treating solution pumped up with the feeding pump 15 with the filter 10, after the temperature control of it is carried out, it flows down the treating solution recovery passage 22, and flows back to the treating solution storage container 6 via the above-mentioned treating solution recovering valve 44.

[0054]in the above-mentioned Embodiment 6, since a treating solution will be attracted with the feeding pump 15 and it will flow down the treating solution recovery passage 22 when a chemical treatment is performed, even if the tube diameter of the treating solution recovery passage 22 is thin, the flow of the treating solution which flows down as compared with Embodiment 5 which only flows down by a fall is boiled markedly, and increases. That is, there is an advantage that the tube diameter of the treating solution recovery passage 22 has been thin enough.

[0055]Drawing 7 shows the outline distribution diagram of the dipping processor concerning Embodiment 7 of this invention. This Embodiment 7 installs 3 sets of the same dipping processors as Embodiment 6 (drawing 6) side by side, and constitutes them. In this Embodiment 7, as shown in drawing 7, in each substrate treatment tub 1, the chemical treatment of said type is independently performed by predetermined treating solution $Q_A - Q_C$, respectively. Each treating solution Q_A which carried out the surface treatment of the wafer W - Q_C are collected and reused by each treating solution storage container 6. Each treating solution $Q_A - Q_C$ can be made to refresh by circulation filtering, and the in-line heater 81 can also perform the temperature control of each treating solution $Q_A - Q_C$.

[0056]Drawing 8 shows the outline distribution diagram of the dipping processor concerning Embodiment 8 of this invention. In [this dipping processor sets one tub in the substrate treatment tub 1 as the tub only for rinse for pure water processing in Embodiment 7 (drawing 7), and] other 2 sets. While a chemical treatment and pure water processing are performed, the point of performing circulation filtering and the temperature control of a treating solution is the same as that of Embodiment 6 (drawing 6). At this Embodiment 8, after the chemical treatment by treating solution Q_A or Q_B is performed by each of the two substrate treatment tubs 1, pure water processing is performed lightly successively and pure water processing by pure water D_W is further performed by the tub 1 only for rinse. By this, the wafer W can be rinsed powerfully, the time required of pure water processing is shortened compared with the case where a chemical treatment and pure water processing are performed one by one by each substrate treatment tub 1, and a throughput improves.

[0057]Drawing 9 and drawing 10 show the outline distribution diagram of the dipping processor concerning Embodiment 9 of this invention, the thick line in drawing 9 shows the treating solution circulating route in the case of a chemical treatment, and the thick line in drawing 10 shows the pure water path and treating solution circulating route of a case of pure water processing. This Embodiment 9 is a point using the single substrate treatment tub 1, and while a chemical treatment and pure water processing are performed, it is common in Embodiment 6 (drawing 6) in that circulation filtering and the temperature control of a treating solution are performed.

[0058]According to this Embodiment 9, at the time of treating solution recovery, it serves also as the treating solution recovery passage 22 between the opening and closing valve 9 of that pump upstream, and the treating solution introduction valve 8 among the treating solution supply

routes 7 in drawing 9 and drawing 10. In drawing 9, when a chemical treatment is performed, the above-mentioned opening and closing valve 9 of the treating solution supply route 7, the treating solution introduction valve 8, and the effluent valve 47a that can switch the effluent way 42 are opened, and other valves are closed. The treating solution Q is pumped up from the feeding pump 15 until it is filled in the substrate treatment tub 1 and it fully overflows it.

[0059]The opening and closing valve 9 of the pump upstream of the aftertreatment solution supply route 7 is stopped. The treating solution Q overflowed from the substrate treatment tub 1. It flows down the treating solution recovery passage 22 via the effluent way 42 and the effluent valve 47a from the overflow collection part 41. It flows into the pump upstream of the treating solution supply route 7 without passing the treating solution storage container 6, it is again pumped up with the feeding pump 15, and after being filtered with the filter 10 and refreshing, it flows back to the substrate treatment tub 1. That is, while the chemical treatment of a substrate is performed, circulation filtering of a treating solution is performed.

[0060]After a chemical treatment is completed, the above-mentioned opening and closing valve 9 and the treating solution introduction valve 8 of the treating solution supply route 7 are closed, and the feeding-and-discarding liquid change-over valve 13 which opens the effluent valve 47a and the treating solution supply route 7, and the treating solution recovery passage 22 of the effluent way 42 for free passage is opened. The treating solution recovery passage 22a of the latter part drawn between the feeding pump 15 and the treating solution introduction valve 8 is opened for free passage by the treating solution storage container 6 via the treating solution recovering valve 44, and other valves are closed. And the treating solutions Q in the substrate treatment tub 1 are collected in the treating solution storage container 6 through the treating solution recovery passage 22a-> treating solution recovering valve 44 of the upstream -> feeding pump 15 -> latter part of the treating solution recovery passage 22 -> treating solution supply route 7.

[0061]In drawing 10, when finishing recovery of a treating solution and shifting to pure water processing, the above-mentioned opening and closing valve 9 is opened, the feeding-and-discarding liquid change-over valve 13 is closed, and the effluent valve 47a of the effluent way 42 is switched to the effluent drain 43a side. The treating solution Q collected in the treating solution storage container 6 is pumped up with the feeding pump 15, and circulation filtering is performed via the filter 10 -> above-mentioned treating solution recovery passage 22a-> treating solution recovering valve 44.

[0062]Subsequently, the feeding-and-discarding liquid change-over valve 13 is closed, the 1st effluent valve 47a of the effluent way 42 is switched to the drain 43a side for wastewater, and the pure water introduction valve 27 of the purified water supply route 3a is opened. It rinses a wafer, pure water D_W being filled in the substrate treatment tub 1, and overflowing it. pure water

D_W overflowed from the substrate treatment tub 1 — the [overflow collection part 41 -> effluent way 42 ->] — the [of one / effluent valve 47a->] — pass the effluent way 21a for effluent valve 47b-> wastewater of two — it is discharged by the drain 43a for wastewater. And circulation filtering of a treating solution is performed also between pure water processings of a wafer.

[0063]This Embodiment 9 is provided with the following abundant functions other than circulation filtering mentioned above. As shown in drawing 9 and drawing 10, the above-mentioned substrate treatment tub 1 is installed in the ultrasonic-cleaning-parts 34 upper part in the effluent tub 2, can wash a wafer powerfully via the ultrasonic cleaning parts 34 with the ultrasonic wave oscillator 35, and can be carried out (henceforth an ultrasonic-cleaning function). The above-mentioned purified water supply route 3 branches to the shower introducing path 3b connected to the pure water introducing path 3a connected to the treating solution supply route 7, and the shower pipe 17, the unit valve 27 which constitutes a pure water introduction valve is attached to the pure water introducing path 3a, and the same unit valve 28 is attached to the shower introducing path 3b. This pure water shower is used, when pure water washes a wafer lightly before carrying out a chemical treatment (henceforth a pure water shower function). Separation discharge of the pure water of the surplus from the unit valves 27 and 28 is carried out in the

drain 43b for pure water recovery mentioned later.

[0064]The above-mentioned effluent way 42 branches to the drainage ditch 21 and the treating solution recovery passage 22 via the switchable 1st effluent valve 47a. The above-mentioned drainage ditch 21 branches via the 2nd effluent valve 47b on the effluent way 21a for wastewater, and the effluent way 21b for recovery. The effluent way 21a for wastewater is connected to the drain 43a for wastewater, and the effluent way 21b for recovery is connected to the drain 43b for pure water recovery. When the quick drain valve 32 for rapid wastewater is attached to the above-mentioned substrate treatment tub 1 and a pure water effluent is discharged from the substrate treatment tub 1, Open the quick drain valve 32, it is made to flow down a pure water effluent in the effluent tub 2, switching operation of the 1st effluent valve 47a and the 2nd effluent valve 47b is carried out suitably, and the drain 43a for wastewater or the drain 43b for pure water recovery is made to carry out separation discharge (henceforth the separation excretory function of wastewater).

[0065]Between the terminal area of the pure water introducing path 3a, and the treating solution introduction valve 8, the above-mentioned treating solution supply route 7 is opened for free passage by the treating solution recovery passage 22 via the feeding-and-discarding change-over valve 13, and the lower end of the treating solution recovery passage 22 is opened for free passage between the opening and closing valve 9 and the feeding pump 15 which were attached to the treating solution supply route 7. The latter treating solution recovery passage 22a and the treating solution effluent way 21c are drawn between the feeding pump 15 and the treating solution introduction valve 8. The latter treating solution recovery passage 22a is opened for free passage by the treating solution storage container 6 via the treating solution recovering valve 44, and the treating solution effluent way 21c is connected to the drain 43b for treating solution recovery via the 3rd effluent valve 47c.

[0066]the case where the treating solutions Q are collected in the treating solution storage container 6 — above — substrate treatment tub 1 → treating solution supply route 7 → feeding-and-discarding liquid — the [change-over valve 13 → treating solution recovery passage 22 → feeding pump 15 → filter 10 →] — pass the treating solution recovery passage 22a (treating solution recovering valve 44) of two — the treating solutions Q are collected in the treating solution storage container 6. In discarding the treating solution Q which carried out exhaustion, while closing the treating solution recovering valve 44 of the above-mentioned treating solution recovery passage 22a, the 3rd effluent valve 47c is opened, and it discharges the treating solution Q to the drain 43c for treating solution recovery with the feeding pump 15. Thereby, separation discharge of the treating solution Q is carried out in the treating solution storage container 6 and the drain 43c for treating solution recovery (henceforth the separation excretory function of a treating solution).

[0067]Into the above-mentioned substrate treatment tub 1 and the treating solution storage container 6, immersion arrangement of the homiothermal heater 5 is carried out, and a treating solution can be conjointly adjusted to a uniform temperature with circulation filtering mentioned above (henceforth the homiothermal maintenance function of a treating solution). Thereby, especially in an elevated-temperature chemical treatment, it becomes possible to supply the treating solution Q of prescribed temperature in the substrate treatment tub 1, and to carry out washing processing promptly, and a throughput improves. While immersion arrangement of the bubbling means 24 is carried out into the above-mentioned substrate treatment tub 1, supplying N₂ gas from the gas supplying path 23 on the occasion of washing processing of a substrate and forming the uniform upflow of the uniform treating solution Q. It is constituted so that washing processing may be promoted (henceforth the bubbling function of a treating solution). The unit valve 37 and the gas filter 38 for gas introduction are attached to this gas supplying path 23.

[0068]It is constituted by the above-mentioned treating solution storage container 6 so that drug solution q₁, q₂, and q₃ may be poured in via two or more chemical introducing valves 48a, 48b, and 48c, respectively. These drug solution q₁, q₂, and q₃ can be prepared, and a necessary treating solution can be made (henceforth the preparation function of a treating solution).

Various kinds of detectors 18 which detect the surface level and residue of the treating solution Q, temperature, etc. are formed in the above-mentioned substrate treatment tub 1 and the treating solution storage container 6.

[0069] Drawing 11, drawing 12, and drawing 13 show the outline distribution diagram of the dipping processor applied to Embodiment 10 of this invention, respectively, the thick line in drawing 11 shows the treating solution circulating route in the case of a chemical treatment, and the thick line in drawing 12 and drawing 13 shows the pure water path and treating solution circulating route of a case of pure water processing, respectively. This dipping processor provides several treating solution storage container 6_A and 6_B from which a treating solution differs to the single substrate treatment tub 1. The point which constituted treating solution supply route 7_{A'} 7_{B'} and the treating solution recovery passages 22a and 22b to each treating solution storage container 6_A and 6_B so that a change was possible differs from the above-mentioned Embodiment 9 fundamentally.

[0070] According to this Embodiment 10, a part of treating solution supply route 7 (between the opening and closing valve 9a and the treating solution introduction valves 8) serves also as the treating solution recovery passage 22 under treating solution recovery like Embodiment 9. The opening and closing valves 9a and 9b which connect two or more treating solution storage container 6_A and 6_B to the above-mentioned treating solution supply route 7 so that a change is possible are also the treating solution selective valves 82. The treating solution recovering valves 44a and 44b which connect two or more treating solution storage container 6_A and 6_B to a part of treating solution supply route 7 (between the opening and closing valve 9a and the treating solution introduction valves 8) which serves as the treating solution recovery passage 22 so that a change is possible are also treating solution ***** 83.

[0071] The quick drain valves 32 and 33 for rapid wastewater are attached to the above-mentioned substrate treatment tub 1 and the overflow collection part 41, respectively, and it is constituted so that an effluent can be carried out promptly, when emptying the substrate treatment tub 1 and the overflow collection part 41. The primary room and the above-mentioned overflow collection part 41 of the filter 10 are opened for free passage by the communicating path 85 via the check valve 86, and when blinding of the filter 10 arises, it is constituted so that a treating solution can be fed in the overflow collection part 41.

[0072] In drawing 11, when the chemical treatment by treating solution Q_A is performed, the 1st opening and closing valve 9a of the treating solution supply route 7 upstream, the treating solution introduction valve 8, the opening and closing valve 14 of the downstream, and the 1st effluent valve 47a that can be switched are opened, and other valves are closed. Treating solution Q_A is pumped up from the feeding pump 15 until it is filled in the substrate treatment tub 1 and it fully overflows it, the opening and closing valve 9a is closed after that, and the 1st effluent valve 47a is opened, treating solution Q_A overflowed from the substrate treatment tub 1 — overflow collection part 41 —> — pass the pump upstream —> feeding pump 15 —> filter 10 —> treating solution introduction valve 8 —> opening and closing valve 14 of the effluent way 42 —> 1st effluent valve 47a —> treating solution recovery passage 22 —> treating solution supply route 7 — it flows back substrate treatment tub 1. That is, the chemical treatment of a wafer is performed, performing circulation filtering of a treating solution.

[0073] After a chemical treatment is completed, the opening and closing valves 9a and 9b and the treating solution introduction valve 8 of the treating solution supply route 7 upstream are closed, and the feeding-and-discriminating liquid change-over valve 13 which opens the 1st effluent valve 47a, and the treating solution supply route 7 and the treating solution recovery passage 22 of the effluent way 42 for free passage is opened. Another treating solution recovery passage 22a drawn between the feeding pump 15 and the treating solution introduction valve 8 is opened for free passage by the treating solution storage container 6 via the treating solution recovering valve 44. Other valves are closed and the treating solutions Q in the substrate treatment tub 1 are collected in the treating solution storage container 6.

[0074]When finishing recovery of a treating solution and shifting to pure water processing, as shown in drawing 12, the opening and closing valve 9a is opened, the feeding-and-discarding liquid change-over valve 13 is closed, and the 1st effluent valve 47a of the effluent way 42 is switched to the drain 43a side for wastewater. Treating solution Q_A collected in treating solution storage container 6_A is pumped up with the feeding pump 15, and circulation filtering is performed via the filter 10 and the 2nd treating solution recovery passage 22a. Subsequently, the feeding-and-discarding liquid change-over valve 13 is closed, the 1st effluent valve 47a of the effluent way 42 is switched to the drain 43a side for wastewater, the pure water introduction valve 27 of the purified water supply route 3a is opened, and it rinses the substrate W, pure water D_W being filled in the substrate treatment tub 1, and overflowing it. pure water D_W overflowed from the substrate treatment tub 1 — the [overflow collection part 41 → effluent way 42 →] — pass the effluent valve 47a → 2nd effluent valve 47b of one — it is discharged by the drain 43a for wastewater. And circulation filtering of treating solution Q_A is performed also between pure water processings of a substrate.

[0075]In drawing 13, when the chemical treatment by treating solution Q_B is performed, The latter part which is open for free passage to the above-mentioned substrate treatment tub 1 treating-solution supply-route 7b Receives, and treating solution storage container 6_B is connected via another opening and closing valve 19b (treating solution selective valve 82). The treating solution recovery passage 22b is connected via another treating solution recovering valve 44b (treating solution selective valve 83) to this treating solution storage container 6_B. That is, when circulation filtering of a treating solution is performed and pure water processing of a wafer is performed the same with being shown in drawing 11 when the chemical treatment of a wafer is performed, circulation filtering of treating solution Q_B is performed in drawing 13. Also in this Embodiment 10, it is constituted so that an ultrasonic-cleaning function, a pure water shower function, the separation excretory function of pure water, the separation excretory function of a treating solution, and a treating solution constant temperature function may be exhibited like Embodiment 9 (drawing 9).

[0076]Drawing 14 and drawing 15 show the outline distribution diagram of the dipping processor applied to Embodiment 11 of this invention, respectively, the thick line in drawing 14 shows the treating solution circulating route in the case of a chemical treatment, and the thick line in drawing 15 shows the pure water path and treating solution circulating route of a case of pure water processing. This dipping processor provides several treating solution storage container 6_A and 6_B from which a treating solution differs to two or more substrate treatment tub 1_A and 1_B. The point which constituted treating solution supply route 7_A, 7_B, and the treating solution recovery passages 22a and 22b to each substrate treatment tub 1_A and 1_B, and treating solution storage container 6_A and 6_B so that a change was possible differs from the above-mentioned Embodiment 10. Other points are constituted like Embodiment 10. The explanation which attaches the same numerals and overlaps is omitted about a member as stated above.

[0077]In this dipping processor, as shown in drawing 14, in each substrate treatment tub 1, the chemical treatment and pure water processing by treating solution Q_A and treating solution Q_B are performed in parallel selectively suitably, respectively. The chemical treatment and pure water processing in that case are performed according to Embodiment 10. Namely, when a chemical treatment is performed, as shown in drawing 14, each treating solution Q_A and Q_B are filled in each substrate treatment tub 1, overflowing treating solution Q_A and Q_B — overflow collection part 41 → — pass the pump upstream → feeding pump 15 → filter 10 → treating solution introduction valve 8 → opening and closing valve 14 of the effluent way 42 → 1st effluent valve 47a → treating solution recovery passage 22 → treating solution supply route 7 — it flows back substrate treatment tub 1. That is, the chemical treatment of a wafer is performed, performing circulation filtering of a treating solution.

[0078]When finishing recovery of a treating solution and shifting to pure water processing, as shown in drawing 15, treating solution Q_A and Q_B in each substrate treatment tub 1 are collected in treating solution storage container 6_A and 6_B , respectively. Treating solution Q_A and Q_B collected in treating solution storage container 6_A and 6_B are pumped up with the feeding pump 15, respectively, and circulation filtering is performed via the treating solution recovery passage 22a of the filter 10 and the latter part. It rinses a wafer, pure water D_W being filled in each substrate treatment tub 1, and overflowing it, pure water D_W overflowed from each substrate treatment tub 1 — respectively — the [overflow collection part 41 \rightarrow effluent way 42 \rightarrow] — it is discharged by the drain 43a for wastewater via the effluent valve 47a \rightarrow 2nd effluent valve 47b of one. And circulation filtering of treating solution Q_A and 6_B is performed also between pure water processings of a wafer.

[0079]Although illustrated in the above-mentioned Embodiment 11 about what connects selectively two substrate treatment tubs and two treating solution storage containers, those substrate treatment tubs and a treating solution storage container can also be increased further. In that case, since two or more chemical treatments were performed in parallel by each substrate treatment tub, moreover the throughput improved further, explained as that to which the chemical treatment and pure water processing by treating solution Q_A and treating solution Q_B are suitably performed in parallel selectively in each substrate treatment tub, but. It may be made to perform a chemical treatment for exclusive use for every substrate treatment tub, respectively.

[0080]

[Effect of the Invention] Since it comprises an invention of claim 1 and claim 2 as mentioned above and acts, the treating solution overflowed from the substrate treatment tub. It is collected by the treating solution storage container via a treating solution recovering valve and a treating solution recovery passage, and since it can circulate and reuse to a substrate treatment tub again, the amount of consumption of a treating solution can reduce substantially. Since a chemical treatment and pure water processing can be performed by a single substrate treatment tub, enlargement of a substrate processing device can be prevented. Since a treating solution is transposed to pure water by making pure water supply and overflow on the occasion of the shift to the pure water processing from a chemical treatment after the treating solution has entered in a substrate treatment tub, the substrate can shift to pure water processing from a chemical treatment, without touching air. Thereby, an oxide film can be prevented from being formed in a substrate face.

[0081]In the invention of claim 3, since it is constituted as mentioned above and acts, while a chemical treatment and pure water processing are performed, a treating solution is effectively refreshed by filtering.

[Translation done.]

*** NOTICES ***

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS**[Brief Description of the Drawings]**

[Drawing 1]The outline distribution diagram of the dipping processor concerning Embodiment 1 is shown.

[Drawing 2]The outline distribution diagram of the dipping processor concerning Embodiment 2 is shown.

[Drawing 3]The outline distribution diagram of the dipping processor concerning Embodiment 3 is shown.

[Drawing 4]Drawing 4 (A) is an outline distribution diagram of the dipping processor in which Embodiment 4 is shown, and is important section drawing of longitudinal section of a liquid path in which drawing 4 (B) shows the B section of drawing 4 (A), and drawing 4 (C) shows the C section of drawing 4 (A), respectively.

[Drawing 5]The outline distribution diagram of the dipping processor concerning Embodiment 5 is shown.

[Drawing 6]The outline distribution diagram of the dipping processor concerning Embodiment 6 is shown.

[Drawing 7]The outline distribution diagram of the dipping processor concerning Embodiment 7 is shown.

[Drawing 8]The outline distribution diagram of the dipping processor concerning Embodiment 8 is shown.

[Drawing 9]The outline distribution diagram of the dipping processor concerning Embodiment 9 is shown.

[Drawing 10]The outline distribution diagram of the dipping processor concerning Embodiment 9 is shown.

[Drawing 11]The outline distribution diagram of the dipping processor concerning Embodiment 10 is shown.

[Drawing 12]The outline distribution diagram of the dipping processor concerning Embodiment 10 is shown.

[Drawing 13]The outline distribution diagram of the dipping processor concerning Embodiment 10 is shown.

[Drawing 14]The outline distribution diagram of the dipping processor concerning Embodiment 11 is shown.

[Drawing 15]The outline distribution diagram of the dipping processor concerning Embodiment 11 is shown.

[Drawing 16]It is an outline perspective view of the substrate processing device which applied the dipping processor of this invention.

[Drawing 17]It is an outline top view of the substrate processing device.

[Drawing 18]It is outline drawing of longitudinal section of the substrate processing device.

[Drawing 19]It is an outline top view of the substrate processing device belonging to conventional technology.

[Drawing 20]The dipping processor concerning the conventional example 1 is shown, the figure (A) is an outline distribution diagram of a chemical treatment, and the figure (B) is an outline

distribution diagram of pure water processing.

[Drawing 21]It is an approximate account figure of the dipping processor in which the conventional example 2 is shown.

[Description of Notations]

1 [— Treating solution supply route,] — A substrate treatment tub, 3 — A purified water supply route, 6 — A treating solution storage container, 7 8 [— A pure water introduction valve, 42 / — An effluent way, 43 / — An effluent drain, 44 / — A treating solution recovering valve, 47 / — An effluent valve, D_W / — Pure water, QA-QE / — A treating solution, W / — Substrate,] — A treating solution introduction valve, 15 — A feeding pump, 22 — A treating solution recovery passage, 27

[Translation done.]